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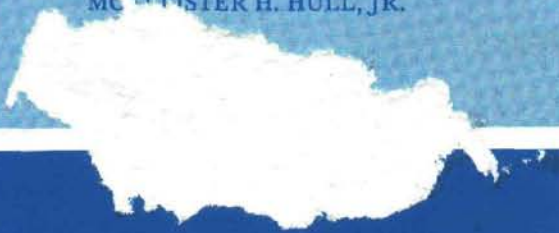

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ROGER PEARSON
General Editor

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THE STRATEGIC DEFENSE INITIATIVE AND ITS POTENTIAL FOR EUROPEAN INDUSTRY

By Stuart Koehl

The Strategic Defense Initiative (SDI) has come to dominate nuclear strategic thought on both sides of the Atlantic since President Reagan's historic address of 23 March 1983. In the opinion of many statesmen, soldiers and scientists, SDI may be the most critical defense issue in the Western Alliance for the next fifteen years. Certainly, the success or failure of SDI will have profound effects on the defense of each nation in NATO, and on the Alliance as a whole.

The strategic implications of SDI have been discussed continuously since the inception of the program, and the debate will certainly continue so long as it exists. One area which has been a subject of particular dissension has been the economic costs of strategic defense, with critics of SDI claiming the system could cost as much as one half of a trillion dollars, and would bankrupt the United States. Some supporters have claimed that with streamlined management, SDI could be deployed at a cost of twenty-five to fifty billion dollars. At this point the exact costs cannot be predicted. In any event, such discussions are largely pointless in the absence of objective standards to measure the benefit derived from the expenditure.

SDI Potential for the Enhancement of Technology

Such discussions miss a critical point. Both critics and supporters of SDI have to date generally treated any funds expended in the program as if the money had been burned. Nothing could be further from the truth. In fact, SDI represents one of the greatest opportunities for technological and economic development ever seen in history. To some extent, this is now being recognized in the United States. However, SDI offers also opportunities to any Western European nation which may choose to participate in the program. The nature of those opportunities, and the critical need for Europe to seize them, are the subjects discussed herein.

Since the early 1970s, at least, European industry has been

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suffering from a malady frequently called "high technology lag". Although Europe excells in the design and manufacture of goods based in traditional industrial techniques and mature technology, such as automobiles, machine tools, heavy machinery, and metallurgy, it has not been able to keep abreast of the cutting edge technology, including microelectronics, cybernetics, bioengineering and advanced material processing. Neither have European firms proven adept in exploiting advanced technologies developed outside of Europe, in the aggressive manner with which Japan adapts and markets the technological discoveries of others. In a global market which demands goods of increasingly sophisticated technology, Europe runs the risk of stagnation and the loss of a sizeable portion of international trade to those nations in Asia and the Americas which offer state-of-the-art products.

Although it has been beset by structural dislocations inherent in the transition from a traditional industrial economy to a high technology economy, the United States has managed, in the last six years, to create more than eight million new jobs, while the economies of Europe have lost several million. The United States has consistently demonstrated its superiority over Europe in the development and application of high technology; it is high technology which is responsible for the majority of new employment in America. Why is this the case, when European universities and technical institutions are capable of producing scientists and engineers equal to any in the United States?

U.S./European High Technology Institutions Compared

There are at least two basic causes. First, the American economy is remarkably unstructured compared to those of Europe. In Europe, large industrial groups and nationalized industries dominate. In the United States, small business provides more than half the gross national product. The absence or loosening of restrictive regulations has led to the establishment of thousands of entrepreneurial companies in what has been termed the "high innovation sector". These small-to-midsized companies actively seek out new markets and create their own demand by applying new ideas and advanced technology to the solution of old and emerging problems in many different areas of business. The high innovation sector is characterized by rapidly shifting trends; to survive, these companies place a premium on flexibility and creativity. The lack of an

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analogous entrepreneurial class in Europe mitigates against the emergence of a "high innovation sector" by preventing the rapid development and exploitation of new ideas. On the whole, European business, organized labor, and government are too inert, too obsessed with security and the status quo, to compete effectively against companies willing to take major risks on unproven concepts, which, if successful, often have spectacular payoffs. Certainly, the failure rate among such businesses is high; but in the United States there is no shortage of entrepreneurs willing to attempt what others have failed. Compare this attitude to that of European businesses, unions and governments, which place a premium on investment safety, stability, and job protection. Thus, the sheer exuberance and diversity of their commercial life is a major contributor to American success in high technology ventures.

The second, complementary element of American success in high technology is the use of major, government-sponsored applied research and development programs which act as focusing lenses for the creative energies of high technology firms. Daily business activity is sufficient to provide incremental improvements in technology or new discoveries in narrowly specialized fields. However, quantum breakthroughs to new levels of technology, require broader, more coherent efforts. To make a simplistic analogy, the ordinary endeavors of thousands of high technology businesses are much like the output of an incandescent light: it illuminates in all directions, yet lacks the ability to penetrate even the thinnest opaque substance. But, if this light is made coherent, and focused as a laser beam, it can cut through steel. Similarly, technological developments can be made coherent and focussed to cut through technological barriers which might otherwise seem insurmountable.

In this century (and in most of those preceding it), war has been this kind of focusing lens. The quest for new, efficient instruments of destruction, and the threat to individual and national survival, provide the impetus for technological research which paradoxically provides the wherewithal for a better life in peace. This is especially true for developments in biomedical science, aeronautics, and electronics, but could be applied to almost any discipline.

Since World War II the United States appears to have found a peaceful substitute for warfare as a technological lens. To suc-

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ceed in this role a program must present broad and challenging technical goals, requiring solutions to new and unforeseen problems in diverse, yet related areas, so as to stretch the boundaries of scientific and technological knowledge. It must have goals cast in a Promethean mold to capture the imagination of scientists and laymen alike, thereby mobilizing the physical and moral resources of the nation in the same manner that the threat to survival mobilizes the nation at war. If possible, the program should present a definite schedule for achieving its goals. The pressure of deadlines forces the pace of development, mandates engineering compromises, and engenders a "get on with it" attitude generally lacking from normal research and development efforts.

Space exploration has provided this role for America. The space program has been the lasing medium for the engineering and entrepreneurial inclinations of the American people, resulting in achievements of extraordinary scope and importance. Consider that in 1958 the United States managed, with great difficulty, to place a two kilogram satellite in low earth orbit; a decade later men walked on the moon and returned safely to earth. Today Americans are demonstrating the ability of man to live and work in space on a regular basis, and are sending unmanned probes to the most remote corners of the solar system.

Spin-Offs from Space Research

However, if the only results of the space program were solutions to the immediate technical problems of space flight, and the expansion of our abstract knowledge of the cosmos, there would be better economic benefit aside from the aerospace firms involved. Indeed, some ill-informed people have called the American space program social welfare for aeronautical engineers. Fortunately, within the solutions of the major problems of space flight reside countless minor problems, the solutions to which may have much broader applications than anticipated. These tangential applications, called "spinoffs" by NASA, have been an unanticipated economic windfall, fully justifying the expenses of programs like Apollo or the Space Shuttle by virtue of the new industries and employment they have created.

The full range of spinoff technologies is too great to recount here. Those interested in the subject should investigate the "Spinoff Reports" published by NASA annually. It should

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suffice, though, to note that there are few, if any, basic areas of advanced technology which do not owe some or even all of their development to the demands of the space program.

A few specific examples should prove this point, beginning with microelectronics and computers. If we live in the age of the computer revolution, we must thank the space program. The demands for highly reliable electronic components packaged in the minimum mass and volume are critical for both manned and unmanned space craft, leading directly to widespread use of integrated circuits. Missile guidance and control, the development of complex navigational algorithms and ballistic computations requiring the execution of many thousands of mathematical operations per second, led to the development of powerful, high speed digital computers. To place these computers aboard mass and volume constrained spacecraft, computers were made smaller, which in turn demanded integrated circuits of greater density and speed. Today, computers found in households and offices are far more capable than any which were available even to military forces in the early 1960s. The cost of computers has decreased, even as capabilities have increased several orders of magnitude, thanks to improved manufacturing techniques developed out of the American space program.

A secondary spinoff of computers in the Space Program is computer assisted design and computer assisted manufacturing (CAD/CAM). Today the aerospace and automotive industries have eliminated thousands of manhours of precision model making, windtunnel and prototype testing by using complex computer graphics and simulation programs in the design process. Design changes which previously took months to implement are today tested and verified in hours by feeding the desired parameters into a computer. This technique was first developed in the space program to validate design concepts without the expense of building hundreds of test vehicles.

Computers are also used on assembly lines for repetitious but precise tasks previously done manually. Robots of this type are used by the hundreds in automobile plants in Japan, the United States and Italy. Robotics are now beginning to affect other manufacturing industries, including electronics and aerospace. The technology for these machines was spun off from the planetary probe and image processing programs of the space program.

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Highly realistic cockpit simulators are being used to train and refresh aircrew, and develop responses to in-flight emergencies. Use of these simulators, first developed to train astronauts, by airlines and air forces saves millions of dollars in such and maintenance each year, while improving pilot proficiency and safety.

Computers, image processing and other technologies developed from the space program have revolutionized biomedical science. The CAT and ultrasound scan use computers and image processing techniques first employed in space probes to create three dimensional views of the interior of the body, permitting accurate diagnosis without exploratory surgery. Almost all modern biomedical sensors were developed out of the need for remote physiological monitoring of astronauts in space, even while they were encased in pressure suits. Today similar sensors are used to monitor patients in hospital or even from their own homes. Alarms signal when vital signs deviate from acceptable parameters. Thanks to miniaturization, these sensors can be implanted in the body, dispensing medication as needed, or even activating cardiac defribrillators without any human intervention.

The need to minimize structural weight and maximize spacecraft payloads led to the invention of a wide range of composite materials with several times the tensile strength of steel at a portion of the weight. These composites are now being used in aerospace and automative manufacturing to reduce structural weight and improve the efficiency of aircraft and vehicles. Computers demonstrate many new and exciting characteristics which permit the exploitation of theoretical designs previously deemed impractical due to the lack of suitable materials. The forward-swept wing now being tested on the Grumman X-29 was first conceived by German scientists in 1945; but until stiff but light carbon-boron epoxy became available, such a plane could not be built. The X-29, along with the latest civil and military aircraft, employ digital fly-by-wire flight control systems, first used on manned spacecraft, to reduce pilot workloads, improve reliability, permit highly efficient flight at reduced cost, and perform otherwise unattainable maneuvers throughout the flight regime.

Indeed space technology has entered our mundane lines so pervasively that it is impossible to pass a single day without encountering some article devleoped out of the space program.

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Breakfast is cooked in a teflon-coated skillet; tennis shoes fasten with velcro; auto tires have belts of kevlar. Televisions, radios, computers and pocket calculators, microwave ovens, dishwashers and automobile ignitions have some or all of their components developed out of space technology.

Economic Gains from Space Research

This has had an enormous effect on industrial economies. The entire Apollo program cost the American taxpayer approximately 23 billion dollars over twelve years. The return on that investment has been staggering. NASA has estimated conservatively that the *direct* rate of return on every dollar invested in space is on the order of eight-to-one. This is an incomplete appreciation; secondary and tertiary applications must also be included. For example, earth observation satellites save billions of dollars annually by giving advance warning of flood, hurricanes and blizzards. Earth resource satellites enable us to spot oil, water and valuable mineral resources in remote locations without the time and expense of sending survey teams to the area. The same satellite helps locate and combat agricultural diseases by infrared analysis of foliage.

In fact, it would be no exaggeration to claim that the impact of the space program has been practically incalculable in monetary terms. However, a Chase Econometrics study conducted in 1976 made the following estimate: for every one billion dollars invested in space research and development, the American gross national product increased by twenty-three billion dollars; more than eight hundred thousand new jobs were created; the money multiplier stood between three and eight. It is probably no coincidence that the period of 1972-1980, during which America had no ongoing major space projects, was a period of economic malaise in the United States. Nor is it entirely coincidence that the American economy has revived in conjunction with a revitalized space program.

What relevance is the previous discussion to the Strategic Defense Initiative? Simply that SDI is potentially the same sort of technological focusing lens as Apollo or the Space Shuttle. Although SDI has a military purpose, this purpose is purely defensive (the protests of the Soviet Union not withstanding, it is questionable whether the United States possesses the offensive nuclear capability to defeat the Soviet Union even if strategic defenses were emplaced). Indeed, the ostensible goal of

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SDI is the prevention of mass destruction through the use of surgically accurate, non-nuclear weapons. The technical problems in developing a practical ballistic missile defense are vast, pushing the limits of our present capabilities. The concept is broad and daring enough to capture the imagination and generate the kind of support needed to propel a technological breakthrough. From a European perspective, one of the most important aspects of SDI is the fact that, for the first time, the United States is actively seeking European support and participation in this effort.

Whether one supports the strategic goals of SDI is immaterial to the fact that the program presents European industry with the opportunity to participate in what could become the greatest research and development program of the decade. Through exposure to the technology, attitudes and environment of the program, Europe may be able to translate the experience into the revived high technology economy it desperately needs.

Weakness of 'Eureka' Program

What of the French-sponsored alternative, Eureka? It is at best a poor second choice, and in all probability, could not yield the benefits of SDI. First, Eureka is *pastiche* of unrelated research projects paralleling the areas of interest to SDI: high speed computers, lasers and particle beams, power sources, etc. But the effort is diffuse; it lacks a single goal which is essential to focus the individual efforts of numerous companies into a synergestic force. Second, there is no sense of urgency in Eureka similar to that found in SDI. Lacking a clear timeframe for their efforts, scientists and engineers will tinker indefinitely with their discoveries; this continual refinement will prevent Eureka from generating spinoffs as quickly as SDI. Third, SDI is in place, funded and looking for contractors. Eureka is still a gleam in Mitterand's eyes. Finally, European experience with French participation in consortium ventures, from Jaguar, Alpha Jet, and Concorde to the Experimental Aircraft Program (EAP), should serve as a warning that cooperation and cost sharing in Eureka will be a more difficult matter than many believe. All of which points to SDI as the best existing option for rapid European assimilation of advanced technologies. As presently structured, SDI is intended only to investigate the technological possibilities of strategic defenses. The question of implementation cannot be answered reasonably until such a

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technical investigation is completed. Implementation is a military and political question, still some years down the road. Even European governments with some misgivings about the strategic wisdom of ballistic missile defense should therefore be able to permit the participation of its industries in the research effort. Thus they will garner the economic benefits of technology transfer and, perhaps, acquire new data and experience which may change their strategic posture.

Economic Benefits from SDI

The economic benefits to be derived from research in SDI can be characterized as primary, secondary and tertiary.

Primary economic benefits are those derived by the direct transfer of SDI technology into the industrial base; spinoffs of this nature will provide the greatest return on investment in the near term. The Strategic Defense Initiative is organized to investigate three functional areas: kill mechanisms, such as lasers, particle beams, and kinetic energy weapons; SATKA (surveillance, acquisition, tracking and kill assessment), the sensors required for ballistic missile defense; and Battle Management, the data processing and communications systems required for coordination, fire control and resource management. The technical challenges in each of these research areas are formidable; it may be that some are unsurmountable in the foreseeable future. Nonetheless, coordinated coherent research will advance the state-of-the-art in all fields involved in the research effort even if a strategic defensive system is never deployed. The Strategic Defense Initiative Organization (SDIO) recently recognized the economic importance of spinoffs by opening an Office of Education and Civilian Applications to identify commercial uses for SDI technology and disseminate them to the public. There are numerous primary industrial applications; enumeration of several should suffice to show their economic potential.

In the field of Directed Energy Weapons (DEW), particularly lasers, SDI has already succeeded in improving the efficiency of high energy beam generation, making the industrial use of lasers for cutting and welding more economical. The Free-Election Laser (FEL), now a major SDI technology, has numerous potential applications in industry and medicine because of the ability to modulate the frequency of the beam it emits. Lasers are under consideration as tracking and targeting

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sensors. Laser Radar (or Ladar) has much higher resolution than radio frequency radars, due to the shorter wave lengths at which it operates. Lasers also have the ability to transmit data along lines of sight at much greater densities than are possible with microwaves. Adaptive optics to control beam focus and compensate for atmospheric distortion can be used in industry to control lasers as cutting tools, to permit the use of lasers for long-distance wireless communications, and to develop microscopic imaging systems for the design and inspection of microelectronic circuitry and other miniaturized components.

Particle beam technology, especially Neutral Particle Beams (NPB) are exploring areas of particle acceleration and beam control essential to the development of controlled fusion technology. The technology of the neutral particle beam is essentially identical to that of the ion propulsion engine. If SDI research leads to practical ion propulsion for space ships, it will have opened the entire solar system to exploration and development. In an analogous case, practical high energy lasers of gigawatt size can be harnessed for space propulsion using laser-initiated or laser-sustained detonation. Designs are already on the drawing boards, waiting only for the vital laser to be developed. Laser propulsion systems have the potential to lower the cost of raising mass to low earth orbit to only a few dollars per kilogram, making space industrialization a realistic possibility.

In the field of Kinetic Energy Weapons (KEW), the electromagnetic launcher, or "rail gun" is considered one of the most promising technologies under investigation. Rail guns are capable of accelerating small to medium size masses to velocities of more than 3000 meters per second in the space of a dozen meters, using controlled magnetic pulses. This technology can be used to improve the capabilities of magnetic levitation mass transit systems now under development in Japan and West Germany. The rail gun, in a larger version called a "mass driver", has been suggested by Dr. Gerard K. O'Neill of Princeton, as an economical means for transferring minerals mined on the lunar surface to an earth parking orbit.

The entire realm of SATKA is replete with potential spinoffs. The basic problem of SATKA is developing sensors capable of detecting small objects, able to discriminate between legitimate targets and decoys designed to dilute the effectiveness of the defenses. The sensors must also be able to detect minute

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changes in the state of the target to determine if the defenses have neutralized it. Accomplishing these objectives will require sensors of an order of magnitude more sensitive than those used today. New infrared and optical sensors will be used in earth observation satellites to survey and locate resources more effectively than present technology permits. It may be possible, through improved image processing technology, to identify marine resources, such as fish, plankton, or submerged mineral deposits, on the continental shelf. These same image processing techniques will be used also in industrial processes for monitoring and quality assurance. It has been suggested that particle beams of relatively low power can be used as mass detectors to determine the density of objects by measuring the nuclear resonations they emit after being bombarded by the beam.

Battle Management (BM) however, may be the area from which the most important immediate spinoffs of SDI will emerge. Integration of the thousands of individual elements in a ballistic missile defense requires extraordinary data processing rates. For Boost Phase Intercept (BPI), potentially the most cost effective form of defense, processing rates on the order of one hundred million bits per second are needed, several orders of magnitude beyond the capability of all but the most powerful computers available today. Computers for battle management, however, must be cheaper and more compact than the present generation of super-computers. The requirement for ultra-high speed data processing will give birth to a new generation of computers which will make today's models obsolete. These new computers will probably use parallel, rather than sequential processing, which will require entirely new methods of programming. The SDI-derived computers will be able to process much larger volumes of data and run increasingly complex simulations, thereby reducing design and manufacturing costs to industry. The immense volume of data being processed, and the short time span available for decision-making requires the battle management system to be more completely automated than any previous military system. Man will be a monitor, an override, a fail-safe component. The dynamic interplay of offense and defense during an engagement implies that two-dimensional stochastic modelling used in earlier automated systems will be wholly inadequate. Instead, greatly improved Artificial Intelligence (AI) and expert systems will permit rapid, correct responses to unique, rapidly evolving tactical situations.

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The battle management system must automatically detect and classify an attack; monitor its own state of readiness; formulate an appropriate response, allocate resources to neutralize the attack; and make continuous modifications to its strategy as the situation changes over time. The civilian applications for artificial intelligence of this order are awesome. To give but a few examples:

Assembly lines can be more fully automated and made more flexible. Industry could then shift from mass production of a few basic models to smaller runs of more diverse product lines specifically tailored to consumer needs, without incurring prohibitive expense. Artificial intelligence can coordinate the subcomponents and processes required for each item in response to programmed inputs.

In aerospace, AI and expert systems can function as "pilots associates", as electronic crewmen monitoring system performance, reducing pilot workload, and recommending appropriate responses in emergencies.

In resource exploration and hazardous material processing, autonomous land rovers and unmanned submersibles will be able to go places too dangerous for humans, without relying on remote control inputs. The vehicles will maneuver in their environment, equipped with manipulator devices and sensors enabling them to complete their assigned tasks in the face of unexpected conditions.

Consider the effect which the computer has had in industry to date; now imagine the impact of a ten-fold or hundred-fold improvement in computer performance. The power of a Cray-II could be packaged to be put on a desk top; the cost of data processing will drop at least an order of magnitude as such capability becomes wide spread.

Battle Management also requires secure, high speed telecommunications to pass targeting and tracking data, systems status and command signals, across global distances. This will drive a requirement for a new generation of communications satellite of much greater number of signals, but, as satellite power increases, the complexity of ground receiver stations will decrease. Within a decade it may be possible to transceive signals via satellite using ground stations of only a few watts output, and antennae less than a meter in diameter.

Electronics, cybernetics, signal and data processing, optical sensor, lasers and particle beams, telecommunications and

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material processing are but a few of the technologies which will be advanced by the inherent requirements of a ballistic missile defensive system. Even if such a system is never deployed, the benefits of coordinated, coherent research in these areas will spinoff into numerous civilian applications.

Additionally, these primary benefits will also feed a wide range of secondary benefits, resulting from the need to implement the results of SDI research, which may have even greater impact than the primary spinoffs. For example, almost every SDI system architecture described to date includes a large, space-based segment. Emplacing this segment will require an integrated space logistics system: efficient low cost transportation; orbital transfer vehicles; heavy lift vehicles; permanently manned construction and repair stations; and ground facilities to support them. In addition, space-based weapons, whether lasers, particle beams or rail guns, will require high density power sources in the 20 to 100 kilowatt range, much greater than any so far deployed. Implementation of space-based defenses, therefore, requires the development of the space intrastructure which is also essential for large scale industrialization of space. Of course, it is possible that this infrastructure will be developed independently of SDI. However, in view of the cost and unproven nature of space industry, it is more likely that industry will take advantage of an existing system than risk its capital to develop a duplicate private system. In that case, there is little doubt that the connection with strategic defense will ensure and accelerate the development of the space infrastructure by providing a national (or international) security rationale to insulate the program from the fiscal caprices of legislators. Additionally, as noted above, certain elements of SDI technology could assist greatly in providing the infrastructure, particularly in the field of propulsion, power, and guidance.

Once the infrastructure is in place mankind will begin reaping the tertiary benefits of SDI through the industrialization of space. The markets for space products are huge, untapped treasures waiting to be mined. There are alloys, crystals and composites which can only be manufactured in the microgravity of space. There are pharmaceuticals which can be produced in purities and quantities required only in space. Energy is free and abundant for industrial processes. Radiation of all types, vacuum harder than any on earth, are easily obtained and

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manipulated in space. There are literally thousands of applications not yet imagined. The economic potential of this market is practically unlimited. Studies have shown that revenues from satellite communications alone will range between fifty and one hundred billion dollars annually, with growth rates of twenty to forty percent. It is estimated that by the year 2000, space industrialization will create between two and three million new jobs in the United States alone, even at the unambitious pace now being set. The Aerospace Industries Association estimates that every million dollars spent on space activities creates one hundred new jobs directly, which does not include the new service industries. It is possible that space industry will provide the key to a clean, safe and permanent solution to global energy problems by constructing gigantic solar power satellites of ten gigawatt capacity. Designs for such satellites have been available for a decade; only the infrastructure and techniques to build them were lacking.

What is the Potential for European Participation

In the short term, however, the primary benefits of SDI basic research justify European participation in the program. Failure to participate will concede a monopoly to American firms on any technologies emerging from SDI, which can only hurt Europe's competitive position. Fortunately for Europe, the United States is actively soliciting their participation in the venture. This is obviously a political move to cement support for SDI within the NATO Alliance; but motivation should not deter Europe from taking advantage of a situation which will benefit the economies of all who take part.

Unfortunately, there are several serious impediments to successful European participation in SDI, some of which are the fault of the Americans, but others can be laid at the doors of the Europeans.

European industry has been, with few exceptions, sceptical of SDI as a means of acquiring new technology. Some do not see the benefits as being as important and far reaching as described. All that can be said is that every day brings forth fresh evidence that the scenario presented may not be visionary enough.

Many European industrialists are sceptical of the willingness or ability of the United States to have a meaningful European segment in SDI, due in part to the size and nature of the present

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program. Numbers being tossed about, such as twenty, fifty or one hundred billion dollars, represent the ultimate cost of an emplaced strategic defense system (as estimated by various authorities). In fact, though, today SDI is living on a rather slender budget. General Abrahamson requested 3.7 billion dollars for fiscal year 1986; he received 2.7 billion. Budgets for the next few years should run between six and ten billion dollars, with the total spent by 1992 being in the vicinity of 25 billion. If the contract amounts being offered to European industry are not for very large sums, blame rests with the total program budget, not the parsimony of American officials in handing business to Europeans.

How Can European Industry Parricipate?

It has also been noted that the bulk of funds authorized for SDI has gone to a relative handful of large American firms. What would remain for European industry? How can it compete against large, incumbent contractors? This view again is a misperception of the program. The large contracts awarded to date have gone to companies involved in the development of large scale demonstration hardware: laser test beds, interceptors, particle beam generators and other capital intensive activities. These programs predate SDI, having originated with the individual American services, brought under the aegis of SDI in 1983. As the programs nearest to fruition, it was natural to allocate their funding as a top priority; hence they have disproportionate shares of the budget at present. But SDI has recognized that innovative technology evolves most rapidly in smaller companies. To this end ten percent of the SDI budget has been reserved for Small Business Innovative Research (SBIR) grants. These grants are primarily for conceptual and small-scale demonstration activities, which are not capital intensive. In fact, with the exception of a few major programs, most SDI contracts total under two million dollars. Nonetheless, as a basis for the development and transfer of new technology, these smaller contracts are of major importance. As the overall budget of SDI expands, and new areas of investigation mature, there will be many areas of opportunity for European industry. Areas of support, and ancillary functions which do not receive the attention of major American companies, provide sources for the acquisition of new technology without direct competition from America's aerospace giants. As SDI matures,

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new, unforseen problems will require solutions. In that arena, European industry starts on the same footing as the Americans; if they have competitive ideas they will win a share of the budget.

But in this regard it must be noted that the direct funding received from SDI will never be a large enough amount (barring actual deployment of a ballistic missile defense) to justify the commitment of major resources by European industry. It is the acquisition of new technology, and the ability to spinoff marketable applications which will be the greatest benefit.

Aside from the levels of scepticism in European business, there are several other significant impediments to overcome.

At the highest level, there is the irreducible fact that SDI is a military program with political and strategic dimensions. The factor of national interest makes the normal client-contractor relationship inadequate for this program. Since each nation of the Alliance has a different perception of its security needs and the effects of SDI upon them, there will be widely divergent positions on the issue; a consistent policy is unlikely.

The strategic dimension also introduces the problems of security and technology transfer. The Soviet Union maintains high levels of effort in technical and scientific espionage. The United States has lately taken steps to halt what is perceived as a hemorrhage of technical secrets to the Eastern Bloc. In the past, American actions in this direction have caused friction within the Alliance. Since the areas under investigation by SDI have critical military applications, obviously the United States will attempt to control their dissemination. However, if technology transfer controls are too restrictive, the effect will be discouragement of the European participation the United States wishes to foster. Many European firms probably will defer any decision on participation until definitive technology transfer guidelines have been negotiated between the respective governments.

At a lower level of policy-making, Europeans face a number of bureaucratic hurdles to meaningful participation, which have already caused some analysts to claim that European firms could *at best* hope for only one percent of the SDI budget. The root causes of the Europeans' problems are a lack of experience in programs of this nature; unfamiliarity with the ground rules of American defense procurement; and a lack of high level contacts equivalent to those of American high technology

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corporations. Compounding the difficulties is the well known predilection of the Department of Defense against procurement of foreign materiel. There is a two-way street, but the traiffic runs predominantly from West to East. The American Congress is partly responsible for this, through the enactment of "Buy American" legislation which effectively bars European participation from most research and development programs. Significant European participation in SDI may also have an adverse effect on American public opinion, if it perceives European industry as depriving American companies of work. Indeed, several U.S. representatives have already denounced SDI for planning to pass too many contracts on to European companies, at a time when not one European contract had been signed.

In addition, Europe will be entering the SDI market several years behind American companies. They will need some special assistance to assimilate the progress made to date, and to identify areas in which they can make significant contributions.

Facilitiating European Participation

There are four basic approaches which may be taken to minimize these barriers and successfully implement European paticipation in SDI.

First, efforts may be made in a decentralized manner through the private sector. Individual firms may bid on research projects without coordination with other companies or their own governments. Companies would enter the program with small contracts and grow from within. The approach offers speed and flexibility, but individual firms lack major bargaining leverage when facing opposition from American companies and the previously noted bureaucratic impediments. In addition, companies may be reluctant to commit their resources in the absence of a governmental commitment to SDI.

A second approach would involve coordinated activity by several firms without formal governmental backing. A consortium would bid competitively for contracts, using their combined resources to gain bargaining power. However, coordination within a consortium is relatively poor, leading to longer response times and higher costs; witness the record of most aerospace consortium programs in Europe. In addition, lacking formal governmental support, the consortium would still face difficulties with international coordination and risk mitigation.

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Nonetheless, such a consortium is now being assembled in Italy, led by Oto Melara and Aeritalia; it will be interesting to observe their progress.

The third approach involves formal bilateral agreements between the United States and individual European governments. Under the terms of such an agreement, areas of cooperation would be established, and the European government would distribute the contracts among its industrial firms. An arrangement of this nature is not practical at this moment due to the limitations of the American procurement system. The American system is based on competition for all but a few categories of procurement, and it is not at all clear if existing regulations would permit relegation of a sizeable portion of the SDI budget to European governments for distribution to their industries. In addition, there is the need for close, direct contact between the contractor and the sponsoring agency, which will inevitably lead to the creation of a dual bureaucracy, with intergovernmental coordination layered above the technical interface, causing needless duplication, delays, and increased costs. Finally, internal political conditions may deter European governments from entering into such an agreement. This is certainly the case in Italy and Canada; even relatively favorable governments in Britain and West Germany have hesitated from giving unqualified support to SDI.

The fourth option is a multilateral arrangement based either within the NATO Allinace or the EEC. The agreement would apportion the work to be done by each nation; governments would then distribute contracts to individual firms. This is the least plausible alternative. Aside from its unnecessary complexity, it is probably impossible to arrive at such an agreement due to the differing political and strategic positions among the allies.

Each of the options presented has at least one major disadvantage. It appears, though, that a combination of the first and third options offers the best available compromise. Initially, European companies should attempt to penetrate the SDI market on their own, using relatively small contractors to build confidence and a base of experience. At some later point, direct bilateral negotiations between governments can be made to coordinate higher policy issues and provide bargaining leverage for industry. This approach offers flexibility to take advantage of the fluid state of SDI research, and would, at a

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later stage, provide some of the security and bargaining leverage which a European firm would need before committing major resources to SDI.

This in fact, is the approach being taken by FIAT. The influence of the Italian Communist Party makes it difficult for Premier Craxi to make a formal arrangement with the United States; hence FIAT (and the Aeritalia consortium) must win contracts in order to build a constituency for SDI in the Italian economy.

It will be difficult to implement such an arrangement. The problems are two-fold. From the perspective of a European government, the initial contract amoutns are very small, rarely more than a few million dollars. It will be difficult to convince a government to risk political capital for what appears to be a program of minor economic consequence. In response, it must be noted again that the dollar amounts awarded for SDI contracts will increase over time, but more importantly, that the cash outlays are not the major rationale or benefit of European participation. Rather, by exposure to new technologies and directed research, European industry will be able to spinoff applications whose value will be many times greater than the profit from direct SDI payments.

On the American side there are several issues related to the unique manner in which the United States manages military procurement. If Europe is to commit itself to SDI, it must have assurances that contracts will actually be awarded for projects on which it places bids. Unlike agreements between European governments, cooperative agreements with the United States carry no guarantees, no multi-year procurements or fixed dollar amounts.

In addition, American procurement regulations requiring competitive bidding on all but a few contracts places European industry at a disadvantage. The divided responsibility for foreign policy and appropriations in the American system also hinders cooperation. There are no assurances that agreements negotiated with the executive branch will be ratified by the legislature, or that Congress will not abrogate or repeal existing agreements. Europe has participated in many programs where the contractual rug has been pulled out from under them. SDI must also be insulated from fiscal turbulence caused by transient economic conditions; to this end it must be exempted from the Gramm-Rudman-Hollings type of budget amendment, if

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the United States expects European participation.

If the United States truly desires European participation in SDI, then direct diplomatic negotiations are required to map out new procedures for administering international programs. SDI is an unprecedented undertaking, and existing laws and regulations do not meet its unique conditions. Europe needs guarantees that it will be able to penetrate the SDI market at a significant level, either by blocking out funds for European ventures, or by delegating areas of research to European firms. They need assurances that contract awards will be made, and that the United States has a long term commitment to SDI (demonstrated by budget stability) which justifies a major investment on their part. The procurement laws must be amended for greater flexibility, or some form of waivers used to exempt European participants from elements of a system to which they are not adapted.

In return, Europeans must be more enterpreneurial, with the vision, creativity and flexibility to exploit the new areas of technology which will soon be opened, if they wish to reap the full benefits of their participation. The space research and development activities being initiated in the United States today will revolutionize the technology products of the near future. It is vital that European industry not be allowed to lage behind as the rest of the world moves into a new industrial revolution.

Europeans in government and industry must be less sceptical of American motives and capabilities. For more than forty years the United States has been a steadfast ally and firm friend to Europe. During that same period American genius has brought about industrial and technological changes which a half century ago seemed mere fantasy. The United States has once more set forth on a major technological quest. They ask Europe's cooperation and participation; it is in Europe's best interest to accept this offer, and to see that any cooperative program succeeds. It is the responsibility of all parties, European and American, to work in good faith to remove the roadblocks preventing rapid and meaningful participation in the Strategic Defense Initiative.

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SCANDINAVIA – THE WEAK NORTHERN FLANK OF NATO

By James L. Waite

During the post-World War II period, prevailing strategic thought regarding the military threat from eastern Europe has been preoccupied with the idea of a central front assault. But recent events that have occurred in and around neutral Sweden have laid challenge to that point of view. Within the past two or three years, European and U.S. defense planners are becoming alerted to the importance of the northern flank of NATO as strategically vital to Western interests. In a recent article, Dov S. Zakheim, a United States Department of Defense strategist observed that:

> For many years, the United States seemed somewhat less than preoccupied with NATO's posture in Scandinavia, an area that is as much NATO's "Northern Front" as it is a flank. In part, U.S. unconcern was accidental, a carryover from the early days of the Alliance when American and British naval forces posed the primary threat to any Soviet aggression against Denmark and Norway, and were expected to balance the ground force advantage that, as elsewhere in Europe, lay with the Warsaw Pact, specifically the Soviet Union and its East German and Polish allies. (1)

This increased interest and activity in the Nordic region has also had its impact on Sweden, its people and policy-makers. This has been particularly true with respect to the rash of submarine intrusions into Swedish territorial waters by Soviet bloc countries and the level of Spetsnaz (spy and infiltration) activity on Swedish territory. Exacerbating the situation is the relative impotence of the Swedish Armed forces to deal with the problem. The purpose of this paper is to examine the responses of Sweden to these crises.

The implications that this has for Swedish and European security is dramatic. The submarine crises have illustrated the emphasis the Soviet's place on a "forward defense" strategy and the role that Sweden plays in that strategy. (2) To understand this perspective, it is necessary to chronical the various input factors to the Swedish crises, and point out two major

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Swedish responses. These are the public reaction to the crises and to the questionable effectiveness of the Swedish armed forces, and the policy-maker's response in terms of economic allocations for the future, particularly as a commitment to the continuance of a strong policy of neutrality.

International Factors

NATO Missile Deployment

One factor that has underpinned the entire European security scene during the past decade has been the planned deployment, and the subsequent actual deployment, of the Pershing II missiles and the ground launched cruise missile (GLCM) system by NATO. This deployment began in earnest in 1983, when the first Pershing IIs and GLCMs were introduced as scheduled. This program did not result in an overall increase in the total number of nuclear warheads in NATO, since NATO had agreed to remove one older nuclear warhead from Europe for each long range INF missile warhead deployed.(3) Despite the fact that the Warsaw Pact's arsenal of nuclear weapons in Europe is more modern than that of NATO, the reaction of the Soviet Union has been to pursue new strategies in its defense posture.(4)

One such approach has been for the Soviet Union to encourage a "nuclear free zone" concept in the Nordic region. This idea was originally proposed by Soviet Premier Bulganin to the Norwegian Premier in January of 1958. At that time, NATO was making plans to deploy U.S. Thor and Jupiter intermediate and medium range ballistic missiles in Europe. The NFZ idea was resubmitted a second time in May of 1963 by Finnish President Kekkonen. The proposal included the entire Nordic area, but not the Baltic Sea, nor any areas of Soviet territory. In 1974 Soviet President Podgorny declared that the Soviet Union "would be ready to guarantee a Nordic NFZ together with the other nuclear powers."(5)

More recent support for the proposal was expressed in 1978, when President Kekkonen repeated the idea in a speech presented in Stockholm. This was endorsed by a retired ambassador of Sweden, Alva Myrdal, who proposed in a series of Swedish newspaper articles, that a NFZ could be set up involving only Sweden and Finland. Her suggestion also failed to include any Soviet territory, but she hoped, "that the proposal, if effected, would then spread to other unidentified European areas."(6) In essence, all Nordic countries are already nuclear-

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free during peacetime. Thus, the subscription to a Nordic NFZ would serve to ensure the continued existence of the NFZ in times of war.

The two major problems with the Nordic NFZ proposal are: 1) the fact that the Baltic and areas of Soviet territory were excluded, and 2) that Norway, Denmark, and Iceland were members of NATO and thus had prior agreements concerning the stationing of nuclear weapons in their countries during war.

The Soviet Union has openly encouraged the concept of a Nordic NFZ and each case of open interest has been associated with the NATO deployment of nuclear weapons. Soviet encouragement has occurred despite the fact that many of the neutral and NATO Scandinavian countries' vital areas are targeted by Soviet nuclear weapons based in the Leningrad Military District and from the Soviet base area of Murmansk. It would be difficult for the Nordic NFZ to be effective if these threats were not removed. The Soviets have made vague offers to cooperate and to consider "some nuclear adjustments," but it is doubtful that the Soviets would remove their striking ability in the Nordic region. It is also doubtful that the USSR would agree to including the Baltic Sea in any agreement since this comprises their main access to the North Atlantic. (7)

Nordic Power Balance Shift

The Baltic defense alignment is fast becoming imbalanced with the tilt more decidedly in favor of the Soviet-controlled Warsaw Pact powers. This imbalance is due to a decentralized NATO organization, to the pattern of deployment of the Alliance defense forces, and to the lack of overall strength in NATO numbers and equipment. (8) Adding to the overwhelming superiority of Warsaw Pact numbers in the area is the recent drift of Finland away from neutral status (which is still *de jure*) to a *de facto* pro-Soviet defense position – a drift which has given rise to the term "finlandization." (9) Allied governments are struggling with guns verses butter economic debates, with the result being a general reduction of real military defense power. (16) Ascerbating this development, with a highly diverse NATO defense force, is the concept of reinforcing minimal front line troops, and the refusal of Norway and Denmark to have foreign troops stationed on their territories. All of these factors contribute to the imbalance. (10)

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Another factor affecting the imbalance is the role played by neutral Sweden. Swedish armed neutrality has, until now, been a critical element in maintaining the Northern balance. Sweden has been the "cork in the bottle" for NATO's northern flank defense strategy. As long as that neutral credibility was secure, the strategy was sound. Even though Sweden has been non-aligned, in reality, Sweden has provided a cost advantage to NATO by providing a credible defense block in the Baltic region and on the northern flank. The problem is that this balancing role has been changing and is seriously threatened. The Swedish defense forces have undergone dramatic changes. Due to internal and international economic problems, the Swedish defense forces have been degraded.(11) This reduction in organization and weapons systems has led to questions about the credibility of Swedish neutrality and has become a definite stimulus to the Swedish nation state responses.

Soviet/Warsaw Pact Aggressiveness

The recent changes in the Nordic Balance has prompted the Soviet Union and Warsaw Pact forces to pursue adventurism in the Baltic which matches the Soviet Union's worldwide expansionism. Soviet expansionism and North Sea oil and gas developments have placed a new strategic importance on the Baltic for the Soviet Union at a time when NATO and Sweden are least prepared politically or militarily to handle the new threat. The new aggressive behavior in the Baltic region has taken three primary forms: 1) illegal military activity, 2) increased espionage activity, and 3) greater belligerence in strategic arms negotiations. The Soviet political leadership has been in a state of flux due to the death of several key leaders, but the consistency of Soviet policy in pursuing these policies has been remarkable.

More will be written about the illegal military activity of the Soviet Union and the Warsaw Pact in the next section, suffice it to say that the intrusions into Swedish territorial waters by submarines and violations of territorial integrity illustrate the point. The increase in Eastern Bloc espionage activity is well documented. The most cogent documentation of Soviet espionage in Sweden is presented in a book entitled *Industri Spionage* by Charlie Nordblom, wherein the increase in KGB activities is described in detail. This book has caused quite a flurry in diplomatic circles with considerable impact on relations be-

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tween Sweden and the Soviet Union.(12)

Paul H. Nitze, Special Advisor to the President and Secretary of State on Arms Control Matters, made this observation regarding the belligerence of the Soviet Union in arms negotiations before the National Press Club, in Washington, D.C. on May 1, 1985:

> The strategy underlying the Soviet approach seems clear. The Soviet Union is pleased with the current strategic situation. They possess substantial advantages in several key measures of strategic offensive nuclear power, especially in prompt counterforce capability. They hold a large advantage in the area of intermediate-range nuclear forces, particularly in longer range INF missile systems. Moreover, they have the only operational ABM system and have, until recently, enjoyed a virtual monopoly in research into advanced ballistic missile defense technologies. Finally, they have the only operational antisatellite system. They want to maintain this situation and, thus, are devoting their efforts to countering any change.
>
> Their most important objective in this regard is to stop the U.S. SDI research program, which threatens to find counters which would negate many of their advantages, both offensive and defensive. Similarly, they wish to abort our strategic modernization program and roll back NATO's INF deployments. To this end, they attack and, thereby, seek to undermine support for these programs by characterizing them as exacerbating the "arms race," all the while remaining silent on the strategic buildup of the Soviet Union.(13)

Submarine Intrusions

On October 27, 1981, the first of the noxious stimuli events occurred with the discovery of a Soviet submarine, U-137, grounded on the coast of Sweden. This grounding happened deep within Swedish territorial waters and in a restricted military district: the submarine was carrying nuclear weapons.(14)

This intentional intrusion of the Soviet submarine and the subsequent accidental grounding was an embarrassment both to the Soviet Union and to the Swedish government. The Soviet Union was caught "redhanded" in its intrusion and the Swedish government was embarrassed in that the discovery was not made by Swedish defense force personnel but by a local fisher-

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man.(15) The grounding occurred south of Sweden in Gåse Fjord, only sixteen nautical miles from Karlskrona, in one of the two most important Swedish naval base areas in the country. Through investigation and boarding of the submarine, it was determined that the submarine was carrying nuclear weapons. While on board the submarine, an unexpected surprise was found huddled below decks. The surprise was the commander of the entire Soviet submarine flotilla at Baltiysk.(16) The unanswered questions following the incident were: How did the submarine penetrate undetected so far into Swedish waters, so close to a top secret military base? What were the Russians doing?

In recent years, the number of violations of Swedish territorial waters has been on a dramatic increase. In 1982, with incomplete data being recorded for the fourth quarter, the Official Swedish Government Report, issued by the Swedish Defense Department, reported 40 submarine violations of Swedish territory; and, of that number, 18 were held to be positive (confirmed) violations. The total number of submarine violations of Swedish waters since 1962 had been 143, with 90 of these violations having been validated.(17) There is no evidence to suggest that these violations are from NATO alliance states.(18) For the years 1983 through 1985 the number of violations has continued to increase. The facts point to increased purposeful Soviet activity.

Since 1981 three areas seem to be the centers for these violations by Soviet submarines: Muskö, in the Stockholm archipelago; the Karlskrona area, in southern Sweden; and Sundsvall Bay, in north central Sweden. Evidence produced by Swedish military authorities has shown that several submarines were involved in the Muskö and Sundsvall incidents, including mother-submarines and crawler type minisubmarines that were deployed far up into the water inlet.(19)

Spetsnaz Activity

One of the most startling developments involved in the intrusions has been the deployment of special forces by the Soviet Union into the coastal areas of Sweden. These deployments have been in conjunction with the submarine intrusions. In fact, there is every reason to believe that these special forces are part of an elite military group under the direction of the Soviet GRU (military intelligence) and KGB.

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The intruder forces have been seen in restricted defensive mine areas and on the coastal areas in conjunction with the mini-submarine intrusions.(20) There is evidence of collaboration with agents or "sleepers" ashore, who have assisted in the deployments.(21) These special forces have come to be known as Spetsnaz, the Soviet Union's Special Forces. The most extensive article written in the Western press on this subject appeared under the pseudonym of Viktor Suvorov, a recent defector from the Soviet Army. Writing in the *Military Review,* Suvorov presents information about the structure, mission, chain of command and role of the Spetsnaz. Among other things, Suvurov says that there are Naval Spetsnaz which are assigned as midget submarine crews and wear naval infantry uniforms. According to Suvorov, "Spetsnaz Naval brigades will concentrate their efforts against Naval Bases, the priority being submarine bases." Other Spetsnaz agents will already be within the country as "sleeping agents" who will be activated several days before a major assault to assist in securing critical points of importance. Some of these agents will penetrate the country in the guise of "groups of tourists, delegations, sports teams or as crews and passengers on merchant ships, civil aircraft or commercial trucks."(22)

An article published in the Swedish newspaper *Svenska Dagbladet,* indicates that Soviet Spetsnaz training camps have been established in the Soviet Union to train diversionary units for assignments in Sweden. The soldiers who train there speak only Swedish, read Swedish newspapers, use Swedish money and, in particular, wear Swedish uniforms. In the event of war, these soldiers would be landed in Sweden either by mini-submarine or parachute, just prior to an assault. Their purpose would be to collect intelligence, disrupt, and knock out vital defense and industrial facilities and to murder high-ranking military and political people.(23)

The writer of the article concludes that the only military power in the Baltic area that is equipped with such mini-submarines is the Soviet Union, and that the recent events in Sweden are directly related to this activity. During a crisis some of these personnel would work in close connection with the Soviet embassy and consulate. These personnel are instructed never to be taken alive. During peacetime Spetsnaz soldiers make trips abroad to gain familiarity with future assignment locales. They are all sportsmen and usually travel in that capa-

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city. The Naval Spetsnaz include minisub crews and travel around as naval athletic teams. Often these personnel travel as part of the Soviet Olympic teams. During wartime, fishing trawlers would be mobilized and would sustain and support operations with the diversionary unit's mini-submarines.(24)

The *Svenska Dagbladet* report indicated that "sleeping agents" had been placed in Sweden and are trained mainly in sabotage. They are believed to have explosives and weapons hidden in the country. These agents are supplied with new identities and hold middle-level jobs in industry and government agencies. It is suggested that some of these "sleeping agents" are engaged in photographing terrain, registering paths and locating places and people who could assist diversionary units that might land.(25)

The questions that seem to bely every discussion concerning the Soviet violations of Swedish territory are: Why would the Soviet Union risk international prestige, to say nothing of the possibility that the Swedes might sink one of the Russian submarines or engage and capture several Spetsnaz personnel, to continue their actions? What are the motives behind these actions? The answer to these questions can only be fully answered by the leadership in the Russian Politiburo. It is clear that these are not merely the actions of local military commanders, but that in light of the continuous nature of these activities, they apparently have the approval of the highest levels of Soviet leadership. These violations have spanned three changes of Soviet national leadership and yet the policy is durable and has withstood all such changes.

There are a variety of possible motives behind the intrusions. That which seems to have the greatest credibility suggests that they are associated with Soviet war planning. This explanation seems to be the most valid when one considers the risks that the Soviets have taken in this entire activity. The Andersson Commission (a Swedish Defense Commission) spoke to this point when they said,

> The main impression is that – even though other motives cannot be excluded – the submarine activity represents preparatory stages in a military-operational plan.... Preparations for the insertion of the type of special units previously mentioned and preparations for use of and sweeping of mines may be part of this plan.(26)

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Sweden is not the target in these war plans, but the target is much more strategic and that is Norway -- particularly, that area of Norway that would threaten the unrestricted access to the North Sea and inhibit maritime traffic from Murmansk, Russia's northernmost submarine base.(27) Certainly, this action would be destabilizing to the northern flank of NATO, which is part of the overall Soviet plan.

Swedish Military Impotence

A third consideration in respect of Sweden's response behavior is that the Swedish military has been relatively unable to stop the intrusions of the Soviet Union and Warsaw Pact states into Swedish waters. The reality of this fact calls into question the viability of the entire concept of a neutral foreign policy. That is to say, if the status of a neutral country is violated at will by an outside power, with impunity, then the concept of neutrality becomes diplomatically and factually meaningless.

Essential to a credible policy of neutrality is the notion that the neutral nation is capable of maintaining its territorial integrity. This requirement has been seriously challenged if not demolished with the submarine intrusions and even more so with the apparent Spetsnaz activity. Even apologists for Swedish neutrality admit that it is impossible to maintain credibility without a strong military establishment. Sverker Astrom, permanent Undersecretary of State at the Swedish Ministry for Foreign Affairs, recently underscored this point.

> The...cornerstone of our neutrality is a strong military defense (coupled with intensive, and expensive, civil defense measures such as shelters drilled into the rocky bottom of our geography).
>
> The military establishment is trained and instructed to repel any attack from wherever it comes, as well as to hinder peacetime violations of our territory. We aim at raising the price of attack to the point where it becomes meaningless in terms of any rational cost benefit analysis.(28)

For Sweden the military implications are quite clear, and that is the Swedish military and in particular the Swedish Navy is incapable of securing its territorial waters against invasion. The Swedish Navy lacks the necessary anti-submarine capability to bring the submarines to the surface. With the demonstrated possibility of Warsaw Pact states being able to come and go at

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will in Swedish neutral waters, the possibility arises that the Soviet Union would use these protected waters as a launch area for medium range missiles borne by submarines.

The Public Response

The reaction of the public to the intrusions in Swedish territorial waters has been varied and yet unidirectional. Unidirectional, in the sense, that sentiment has largely been anti-Soviet and pro-nation. There has been a definite tendency to "rally around the flag." Swedish nationalism has re-emerged. The data for this assertion have been drawn principally from two studies.(29) Both of the studies were conducted by the Beredskapsnamnden for Psykologiskt Forsvar [Bureau for Psychological Defense] and use acceptable survey research techniques and standards. Both of the studies involved national sampling being conducted at various intervals of time: including a survey in May of 1983, following the intrusions in the Stockholm archipelago, and in March of 1984, following the Karlskrona intrusions. For purposes of the discussion these studies will be treated together, with the focus being on the responses rather than on the unique incidents.

Basically there were eight issues to which the respondents were asked to reply. For purposes of analysis these can be divided into two general categories: internal and external concerns.

Internal Concerns

Five of the eight questions were directed at the internal concerns of the respondents. The first question in this group was, "Do you believe that our defense posture increases our chances of staying out of an eventual war?" Table One presents the data related to this question and the responses offered since 1974.

As can be seen in the table, there has been a decrease in the faith of the Swedish people that the military would be able to effectively maintain the peace. The most dramatic change of opinion followed the intrusion of the submarines (March 1984 was the date of the major intrusion in Karlskrona.)

The second question dealt with the defense will of the people and was stated as follows: Suppose Sweden were invaded. Do you believe that we should conduct armed resistance even if

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Table 1

Faith in the Military's Ability to Maintain the Peace

Question: Do you believe that our defense posture increases our chances of staying outside of an eventual war?

Year	Yes %	No %	Don't know %	Average
1974	55	41	5	+14
1975	43	49	7	- 6
1977	31	61	7	-30
1978	31	61	7	-30
1979	50	46	4	+ 4
1980 Sp	45	49	6	- 4
1980 F	48	47	5	+ 1
1981 Sp	54	44	2	+10
1981 Sep	52	45	3	+ 7
1981 Nov	46	51	4	- 6
1982 Sp	52	43	4	+ 9
1982 F	54	44	2	+10
1983 Sp	60	37	3	+23
1983 F	53	46	2	+ 7
1984 Mar	36	56	7	-20
1984 Apr	44	52	5	- 8

Source:Sweden, Bureau for Psychological Defense, "Ubatsjakten i Karlskrona och Svensk Opinion", No.124 (Stockholm 1984)p.9.

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Table 2

Attitudes Toward Armed Resistance During Invasion : 1952-1984

Question: Suppose Sweden was invaded. Do you believe that we should conduct armed resistance even if the outcome for us seems uncertain?

Year	Yes %	No %	Don't Know %
1952	79	6	15
1956	82	8	10
1957	79	8	13
1958	66	12	22
1960	68	12	22
1963	71	13	16
1964	72	6	22
1965	79	8	13
1966	75	10	15
1967	78	15	7
1968	73	17	10
1969	75	14	10
1971	73	15	12
1972	73	12	12
1973	79	13	9
1974	75	16	8
1975	75	14	12
1976	72	15	14
1977	68	16	15
1978	68	16	16
1979	71	14	15
1980	73	14	13
1981	80	12	8
1982	78	11	11
1983	81	11	8
1984	74	15	11

Source:Sweden, Bureau of Psychological Defense,"Ubatsjakten i Karlskrona och Svensk Opinion", No.124,(Stockholm 1984) p.12.

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Table 3

Attitudes Toward Defense Strength: 1963-1984

Question: Do you believe that our total defense today has too little strength, is too strong, or is about strong enough?

Year	Too Little %	About right %	Too Strong %	Don't Know %
1963	12	57	8	23
1965	12	56	9	21
1967	16	55	9	20
1968	17	69	5	10
1971	5	61	9	14
1972	20	60	6	13
1973	13	66	14	7
1974	17	62	9	12
1975	16	66	5	13
1976	19	59	9	13
1977	20	50	9	21
1978	22	52	9	18
1979	27	48	8	17
1980	26	49	9	16
1981 Sept	22	59	5	14
1981 Nov	42	46	5	7
1982 Sept	29	54	6	11
1982 Nov	30	44	9	17
1983 Sp	46	43	6	6
1983 F	36	48	5	12
1984 Mar	35	47	7	11

Source: Sweden, Bureau of Psychological Defense, "Ubatsjakten i Karlskrona och Svensk Opinion", No. 124, (Stockholm 1984) p. 15.

Table 4

Attitudes on the Need for a Defense

Question: Considering the world situation today, do you think that Sweden should have a defense?

Year	Yes %	No %	Don't Know %
1979 F	87	10	3
1980 Sp	88	9	3
1980 F	86	11	3
1981 Sp	90	8	2
1981 F	90	7	3
1982 Sp	88	9	4
1882 F	91	8	2
1983 May	95	3	1

Source: Sweden, Bureau for Psychological Defense, "Ubatshotet och Svensk Opinion", No.118, (Stockholm 1983), p.9.

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Table 5

Faith in the Military in Karlskrona

Question: How much faith do you have in the military's ability to do its job, regarding the submarine intrusions in the Karlskrona archipeligo?

	Quite alot %	Very little %	Don't know %
National Survey			
March 1984	64	27	9
Men	64	33	3
Women	64	22	14
Karlskrona			
February 1984	76	18	6
Men	77	18	5
Women	74	18	8

Source: Sweden, Bureau for Psychological Defense, "Ubatsjakten i Karlskrona och Svensk Opinion", No.124 (Stockholm 1984), p.22.

Table 6

Perceptions of the USA's and USSR's Policy Toward Sweden During the Years 1973, 1976, and 1979-83.

Question: Regarding the relationships of USSR and USA toward Sweden, which countries' policies present a threat toward Sweden?

Year	Threatening %	No direct threat %	No Unfriendliness %	Friendly %	Don't know %
United States					
1973	3	47	34	11	5
1976	2	13	54	23	6
1979	2	7	45	39	8
1980 Sp	1	6	46	38	10
1980 F	3	7	49	34	7
1981 Sp	4	10	50	32	5
1981 Sep	4	14	54	24	5
1981 Nov	8	11	45	32	4
1982 Sp	3	14	51	24	7
1982 F	4	15	56	21	3
1983 May	2	10	46	39	3
Soviet Union					
1973	4	15	57	18	6
1976	6	21	55	12	5
1979	10	24	42	15	9
1980 Sp	8	25	46	10	11
1980 F	12	24	45	11	4
1981 Sp	13	27	45	8	6
1981 Sep	14	29	44	7	5
1981 Nov	34	37	20	4	5
1982 Sp	17	43	30	3	7
1982 F	32	41	21	3	3
1983 May	42	41	12	2	3

Source: Sweden, Bureau of Psychological Defense, "Ubatshotet och Svensk Opinion", No.118, (Stockholm 1983) p.21.

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Table 7

Feeling of Fear Caused by the Submarine Intrusions

Question:Do you feel any feelings of fear with respect to the continuing submarine intrusions?

	Yes, a great amount %	Yes a little %	No %	Don't know %
National Survey				
March 1984	27	28	43	1
Men	16	26	58	0
Women	39	30	29	2
Karlskrona Survey				
February 1984	24	22	54	0
Men	18	17	65	0
Women	31	27	42	0

Source:Sweden, Bureau of Psychological Defense,"Ubatsjakten i Karlskrona och Svensk Opinion", No.124,(Stockholm 1984) p.24.

Table 8

Attitudes Toward Swedish Disarmament: 1968-83

Year	Yes Unilateral %	Yes, if other small states do %	Yes, if all others do %	No %	? %
1968	5	9	69	12	5
1971	10	8	63	14	6
1974	9	11	59	14	7
1980	13	10	59	13	5
1981	13	7	56	21	3
1982	9	10	64	13	4
1983	12	10	63	11	4

Source: Sweden, Bureau of Psychological Defense,"Ubathotet och Svensk Opinion", No 118, (Stockholm 1983), p.19.

Table 9

Swedish General Government Expenditure and Revenue

Millions of Swedish Crowns

Year	Current Expenditure	Current Revenue
1977	197 552	215 826
1978	227 105	238 628
1979	261 908	262 497
1980	303 059	130 657
1981	348 24	363 047
1982	395 720	371 576
1983	443 363	424 982

Source: Nordic Council, Yearbook of Nordic Statistics 1984 Vol.23 No.16 (Stockholm: Nordstedts Tryckeri, 1985) p.270.

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Table 10

Swedish Military Expenitures 1960-1983

Million US Dollars

Year	1980 Constant Prices	% of GNP
1960	2456	4.0
1970	3512	3.6
1975	3801	3.3
1980	4008	3.2
1982	3960	3.3
1983	3918	3.4

Source: Nordic Council, Yearbook of Nordic Statistics 1984 , p. 271.

Table 11

Summary of Swedish Defense Appropriations 1983/86

Unit	1983/84	1984/85	1985/86 *	84-86 change
The Ministry	46.0	43.3	45.1	+ 1.8
Mil.Defense	20,493.5	21,185.7	23,058.5	+1,872.8
Army	6,862.2	7,225.0	7,772.0	+ 547.0
Navy	2,850.7	3,031.0	3,356.6	+ 323.6
Air Force	5,950.5	6,825.4	7,187.2	+ 361.8
Operative Command	738.4	818.6	868.6	+ 50.0
Joint Agencies,etc.	4,091.7	3,285.7	3,876.1	+ 590.4
Civil Defense	854.5	1,083.0	1,246.5	+ 163.5
Economic Defense	525.6	386.1	432.5	+ 46.4
Other Total Defense	97.3	136.8	97.0	-39.8
Rescue Services	39.7	33.3	34.9	+ 1.6
Misc.	23.9	157.6	167.2	+ 9.6
Total	22,080.5	23,025.8	25,081.7	+2,055.8

* Appropriated

Sources:Sweden, Ministry of Finance, The Swedish Budget 1983/84; 1984/85; 1985/86 (Stockholm) PP 74; 76; 77 resp.

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the outcome for us seems uncertain? Table Two illustrates the trend of responses to this question over the past 30 years.

The remarkable aspect of the response to this question is the stability of the Swedish attitude regarding the defense of the homeland and their will to defend it. Except for several minor deviations, the percentage of positive responses has hovered around 75% throughout the thirty year period.

A third internal attitude response dealt with the strength of Sweden's defense forces. Table Three depicts this internal response profile.

Here the data shows that since 1963 there has been a steady awareness that the military was not sufficiently strong. The dramatic change in attitude has occurred since 1981 as the number of intrusions by Warsaw Pact forces into Swedish territory increases.

The fourth and fifth questions of an internal concern have to do with the existence and viability of the national defense establishment. Tables Four and Five reveal the evolving attitudes toward the need for a defense and specifically how well it handled its job in Karlskrona, during the crisis.

As the tables show, there exists a universal agreement on the need for a Swedish defense. However, the support has increased as Sweden has been drawn deeper into the submarine intrusion crises. Regarding the faith in the performance of the Swedish military, there is a general consensus that it has performed well, but there is less support for that notion as one looks at the response throughout Sweden than when Karlskrona is polled specifically. Those closest to the crises seem less critical of the conduct of the military.

External Concerns

The remaining three questions deal with external concerns or those concerns that focus on causes perceived as external to the nation state. Table Six touches upon the Swedish perceptions of the Soviet Union and the United States.

As the table clearly indicates, the greatest threat to Sweden as perceived by the Swedes is the Soviet Union. As the perception of the Soviet Union has worsened the perception of the United States has improved. This perceived threat of the Swedish people toward the policies of the Soviet Union raises the question of the level of fear that is being generated in the society by the recent crises. Table seven provides insight into

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that question.

The data here illustrates that feelings of fear were evenly divided. Those close to the crises seemed less fearful than those at long range. In both the national survey and the local survey women reacted more fearfully than did the men.

The final question of external concern is over the issue of Swedish disarmament. Table Eight demonstrates the relatively stable attitude that the Swedes hold against Swedish disarmament.

Economic Response

Current Swedish security policy and the economic implications of that policy are the result of long range planning that began in 1978 when the Parliamentary Committee on Defense was appointed. The Committee was tasked with submitting proposals on defense to the Swedish Government for consideration. These proposals were to cover the period from 1982-1987. The work of the committee was produced in three phases. The first phase was to consider the objectives of Swedish security and defense policy and to submit proposals in this field. The second phase of the work was to consider prospective plans from the total defense authorities. These plans were intended to be background for program planning. The third and final phase of the Committee's efforts was to study proposals for new combat aircraft and information from various experts concerning peacetime military organization, price indexing, and coordination between civil defense and local authorities. It is from these general policy proposals that Swedish military economic planning has proceeded.(30)

The general guidelines submitted by the Parliamentary Committee have had to be altered as a result of the repeated intrusions into Swedish territory by foreign military submarines. In fact the attempts to resist such intrusions while maintaining a neutral foreign policy in the midst of the recurring crises has been extremely expensive. Olaf Palme, the Swedish Prime Minister, has been faced with demands to increase defense spending to counter the growing threat to Swedish sovereignty.(31)

As is the case with most of the world, Swedish general government expenditures and revenues from 1977 to 1983 have increased. Table Ten details military expenditures in constant price figures and also depicts what percentage these expendi-

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tures represent in terms of the gross national product. Real defense spending has remained relatively stable for this period, as has its percentage of the GNP, but during this period, the larger share of defense appropriations have gone to the operational military forces, with the Army being the big winner. The Navy has received a substantial increase particularly in the area of ASW assets. The Air Force budget has had to cover the cost of development of the JAS 39 Gripen aircraft system, and in addition the Air Force has had to provide incentives to keep pilots in the service.(32)

This shift of emphasis within Swedish defense system has not occured without conflict. The armed forces have been divided over plans to strengthen the Swedish Navy at the expense of the Air Force,(33) a decision made as a result of the submarine intrusions. Overall, Swedish military expenditures have remained constant with a recent slight increase, and as a result the number of members in the armed forces have had to be reduced, from nearly 75,000 in 1973, to about 68,000 in 1983. GNP has increased over the past decade, and yet the percentage that has gone into military expenditures has not increased proportionately.(34) Now, due to the submarine intrusions, there is an attempt to reorganize the allocation of defense resources, without increasing the percentage of the Gross National Product allotted to defense.

Summary and Conclusion

Although not all-inclusive, the manner and direction of these responses are key indicators of how the Swedes view the challenge to the security of their country. From the two types of responses reported, several points can be deduced. First Swedish neutrality as a concept is not dead, and is still generally supported by the population and the policy-makers. However, the situation is undergoing reevaluation and the result may be a more balanced policy, keyed to reality, rather than directed by ideology. The past expressions of "active neutrality" meant open criticism of the West with a near "no comment" of the East. This position has entirely changed. Second, the role that Sweden has historically played as a balancing agent in the Nordic region may be beyond the ability of the Swedish government to maintain. NATO and other interested European powers may have to assume more responsibility, particularly in light of the extreme costs of that role. Finally, the strain of maintaining

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territorial integrity will remain with Sweden and the economic and psychological consequences are not likely to end soon. In essence, Sweden is in for a "long haul" of stress. The Soviet Union and Warsaw Pact forces are not likely to change strategic operational planning as long as this appears to be successful. This will place greater demands on the Swedes to defend their freedom as an independent nation state, but the indications are favorable to the possibility that public opinion will exert pressure on the administration to meet this challenge.

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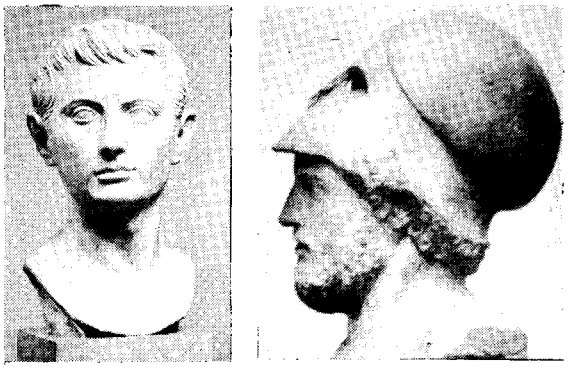

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REDUCING DEFENSE COSTS

By Robert C. Richardson, III

A massive reduction in U.S. defense spending is threatened by the Gramm-Rudman-Hollings Act, and many who see the security of the Western World as dependent on U.S. defense spending are appalled. But defense efficiency is not necessarily tied directly to dollar spending. If reductions in defense spending imposed by the Act are accompanied by decisions to implement the President's Strategic Defense Initiative (SDI), or to reduce the length of the new weapon acquisition cycle, deterrence of nuclear aggression can be sustained and even reinforced while Congress and the Administration act to reduce the Federal budget deficit to zero.

The basic principle behind this reasoning is simple. If all the money in today's Department of Defense budget were in fact essential to the security of the U.S., any major cuts would obviously reduce U.S. security as alleged by the critics of the Act. The truth is, however, that many of today's defense activities and policies exist primarily for political or vested interest reasons. Reducing or eliminating the tax dollars that support these should therefore not reduce U.S. security but could even improve it.

Many proposals have been made for changes in defense policies, procedures, and activities on the grounds that these would provide greater effectiveness at less cost. So far most of these proposals have fallen on deaf ears. The reason for this is not necessarily that they were wrong. Instead, it is because Government bureaucracies inherently resist any major changes, especially when proposed by outsiders. They tend to be rejected primarily because they imply criticism of management, bear a "Not Invented Here" label, or are deemed to be a threat to on-going programs and to the careers of the bureaucrats that have a vested interest in these.

In the real world substantive changes in strategy, policy, and traditional activities come about only when bold leaders demand that they be made. This, in turn, generally occurs only when the consequences of not adopting the changes exceed the resistance of the "system" to their adoption. It thus takes a

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combination of two elements, bold leadership and dire consequences of inaction, to achieve substantive change – and, substantive savings in costs that do not degrade the ability to do the job, whatever it may be, can only be achieved by making substantive changes.

Cost Saving Changes

Both experts and amateurs have repeatedly pointed out that we could save millions, if not billions, and improve our defenses, by making major changes in several key areas of defense. Principle among are those suggested are:

1) Changing our strategic strategy from Mutual Assured Destruction (MAD) to Assure Survival by implementing the President's Strategic Defense Initiative (DSI). This would take the relative quantity factor out of the costly, MAD, offensive missile arms race and eliminate the need for multi-billion dollar missile shelters and other expensive passive hardening schemes.

2) Reducing the weapon system acquisition time from today's 13 year average to the 6 year or less average of the 1950s would save billions. This requires, however, that we abandon the "low risk" approach introduced in the 1960s under McNamara, which has turned out to be a costly disaster fraught with waste, if not dishonesty, and that we adopt the "high risk" approach that made it possible in the 1950s to put high technology systems like Polaris into use in only 4.2 years.

3) Revising the 1947 Defense Organization Act so as to eliminate the wasteful and costly layers and duplications in defense management which have resulted from over-centralized decision-making. Eliminating the Service and Service Secretary staffs made essentially useless by this centralization trend would save manpower and money. We should also merge and unify the separate Service Systems and Material Commands that now compete to support already Unified Operational Commands.

4) Abandoning the politically dictated NATO Strategy of "Conventional Flexible Response," that makes little or no military sense, in favor of a return to the 1956 NATO Strategy of "Tactical Nuclear Response from the Onset". This could save millions if not billions now paid solely to maintain a so-called firegap to hopefully delay resort to nuclear weapons until we have lost Germany (if not most of Europe) to admittedly superior Soviet conventional forces.

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Although these problem areas have been recognized by Senators, Generals, and lay experts over the past 20 years very little has been done to correct them. The findings and recommendations of the numerous Commissions, Committees, and Study Groups, charged from time to time with examining these areas, have seldom led to substantive corrective actions. The Grace Commission is but one of the most recent examples of this in the acquisition and organization area.

The problem in getting corrective actions lies in the fact that resistance to changes in any large bureaucracy, be it Congress, DOD, or the separate Armed Services, is inherently so great as to preclude the acceptance, or defeat the implementation, of substantive changes until a national crisis, war or dire economic or political developments generate pressures adequate to overcome this resistence. The need to reduce defense spending to comply with the Graham-Rudman-Hollings Act could well meet this criteria.

There is no question but that the U.S. could have as good or better defense capabilities than we now have at less cost. But, this cannot be achieved through minor changes aimed at eliminating alleged waste or improving effiency, nor through merely eliminating selective weapons or programs as so often advocated. These save only pennies, not dollars, and as often as not the corrective actions do not last very long.

What we now need in most areas is revolutionary change not merely evolutionary adjustments. The President and Congress must have the courage to address the basic causes of high defense budgets, waste, and inadequate capabilities – not just the symptoms. This means coming to grips with fundamental issues, such as: defense strategies and other activities that exist to serve political purposes, not basic military needs; overcentralization of decision-making and the resulting separation of authority and responsibility; eliminating people and organizations from having a say in decisions where these have no direct responsibility for the end result (today it is hard to tell whether a new missile design was determined by professional missile experts or congressional aids and arms control buffs) and the need to revise an archaic defense organization established 40 years ago more as a political compromise than as an efficient defense structure.

Let us take a brief look at some of the key areas where temporary but major savings could be made by revolutionary

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changes, many of which are long overdue for reasons of efficiency, as well as of economy.

Savings due to SDI

Mutual Assured Destruction (MAD) is one way to reduce the cost of defense by changing strategy. No general would ever have proposed that the armed forces should be designed and equipped primarily to revenge an attack! Yet, today, the costly, MAD, offensive missile arms race, and the multi-billion dollar missile shelter schemes associated with it, are the direct result of this politically and academically inspired strategy that President Reagan which hopes to change with his Strategic Denfense Initiative (SDI).

The U.S. strategic Strategy of Mutual Assured Destruction (MAD) came into being not as a result of sound military planing, but as a result of political and academic reactions to atomic warfare. MAD violates the basic principle that the role of the military is to defend the country, not revenge it. MAD offers no protection against an attack if it occurs, or even against accidents. It was a no-win, non-defensive, non-counter-force, strategy that runs counter to every principle of warfare from Sun Tzu to Clausewitz. U.S. security can thus be improved by replacing the strategy of Mutual Assured Destruction by that of Assured Survival, provided that the Congress merely implements the Strategic Defense Initiative (SRI) program proposed by President Reagan.

An early decision to develop and deploy defensive systems, now possible as a result of the work that SDI and High Frontier have done, would allow the President and the Congress to start eliminating from the defense budget those funds for programs solely intended to perpetuate the MAD strategy, such as survival basing or hardening to protect against a massive Soviet First Strike. The resulting economies would more than offset any near term increases in SDI development costs and provide a relatively safe course from which to help meet the deficit.

There is a tendency to ignore the fact that the principle goals of all U.S. defense activities should be: first, to prevent wars by maintaining the best possible deterrent; and second, to provide America and its people with as much protection as possible should deterrence ever fail, or should accidental or terrorist nuclear threats ever materialize. This is the purpose of SDI.

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When the U.S. enjoyed clear-cut nuclear superiority the deterrent-only strategy of MAD was deemed adequate regardless of its other shortcomings. MAD never had any credibility as a defense. MAD has now lost much of its credibility as a deterrent due to the shift in the strategic balance in favor of the Soviets over the past decade. The President recognized this in his March 1985 speech, initiating SDI, when he said:

> "The strategy of deterrence has not changed. It still works. But what it takes to maintain deterrence has changed. It took one kind of military force to deter an attack when we had far more nuclear weapons than any other power; it takes another kind now that the Soviets, for example, have enough accurate and powerful nuclear weapons to virtually destroy all of our missiles on the ground." SDI will provide the "other kind".

Given effective strategic defenses, relative numbers of strategic missiles become essentially meaningless. Who cares how many ICBM's the Soviets have if they can't penetrate to their targets? The defenses built as a result of SDI will reinforce and perpetuate deterrence regardless of the Soviet build up of offensive forces. In addition, they will provide protection for America if deterrence should ever fail, and will eliminate relative numbers of missiles and costly survival schemes as major factors in determining what we have to spend for security.

As we shift from deterrence based on offensive retaliation to deterrence based, at least partially, on defenses we will no longer have to try to match the Soviet buildup in offensive nuclear forces in order to maintain rough military equivalence. This is why the adoption of SDI can make a temporary reduction in our defense budget acceptable if not desirable from the point of view of our national security.

Savings in the NATO Area

Is the NATO Flexible Response Strategy the best and least costly method of defending Europe from a purely military point of view? Of course not. It was imposed upon the military in 1966 by political aspirations to reduce the need to resort to atomic weapons from the onset, which the 1956 NATO strategy properly called for.

We pay billions annually to maintain a conventional firebreak in Europe which we know can't last more than 15 to 30 days. This is based on the militarily illogical assumptions that

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either the Soviets will risk surrendering the tactical nuclear initiative to the U.S., rather than using all weapons from the onset, or that NATO and/or the Soviets would accept conventional defeat rather than resort to nuclear firepower.

A return to the militarily sound NATO strategy that existed from 1956 to 1966 could save millions, if not billions, now spent to achieve a flexibility dictated more by political aspirations than military logic.

Savings in the Acquisition Process

Is the McNamara introduced low risk, fly-before-buy concept of today's weapon acquisition the most economical and militarily effective procedure? Of course not. This concept calls for having all technology in hand and tested before approving the development of any new weapon system. The kindest thing that can be said about it is that it was introduced to try and meet Congressional objections to cost overruns and occasional failures that are inevitable in high risk programs. Some say it was adopted to stretch out the process so the Soviets could catch up with the U.S., as deemed necessary to obtain SALT type treaties. Whatever the reason for the adoption of the low risk approach in the 1960s, it has four basic liabilities and adds billions to the cost of new weapon systems.

1) It has stretched the acquisition process from 4 to 6 years in the 1950s (Polaris and Atlas) to over 13 years today (MX and BI).

2) It has added billions to weapon system costs since each year added to the development cycle adds roughly 30% to all up system costs.

3) It makes it impossible for a President, blessed with two terms in office, to build and deploy a new weapon system, on his watch.

4) It insures that the Soviets have ample opportunity to see what we are building, steal or copy our technology, and come out with as good weapons at the same time if not ahead of us, and

5) It makes it near-impossible to defend the defense budget when DOD has to go back to Congress, to ask for mega bucks for the production of an obsolete system, 10 or more years after an earlier Congress had enthusiastically approved the concept and the initial research for it.

In brief, cutting the acquisition process to less than 8 years

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for major systems, can save billions per year in defense spending and also improve U.S. capabilities vis a vis the Soviets. This requires not minor DOD action, but bold political decisions such as: a return to high risk acquisition policies; reducing the decision level; and eliminating the right of organizations and people who have no responsibility for operating the end result to have a say in the program. What we are talking about with respect to this last requirement is meddling by State, ACDA, Congressional aids, other Services, etc.

Saving in Defense Reorganization

Is today's DOD, JCS, and Service Organization the most economical and efficient for our defense establishment? Of course not. It is a 1947 political compromise fraught with duplication, over-layerization, and over-regulation. Merely tinkering with the JCS role, or other minor changes, will not improve conditions or save money. There are three fundamental shortcomings in today's DOD organization that some studies have evidenced, if not admitted to:

1) There is *no* ready, in-being overall military Commander either in peacetime or immediately available in the event of war.

2) While all services use similar weaponry (aircraft, missiles, etc.), there is no way people can flow back and forth easily with changes in the service requirements for these. We see one service recruiting and training pilots, mechanics, and missileers at great cost, while another is often cutting back on the same expertise!

3) The centralization of decision-making at OSD and above has made Service staffs and Service Secretaries essentially obsolete "make work" levels. These staffs must presume to be: smarter than the Unified Commanders as to what they need; smarter than the Systems Commanders as to what can be built; or able to out-guess what the Secretary of Defense or White House staffers will approve. Having no inherent power of decision on substantive matters, ever since McNamara centralized decision-making at the Secretary level, the Service Secretaries and their large staffs have no real roles. These, and many of the Service Chiefs staffers, could be eliminated or redistributed to whichever of the above three levels they are most qualified to serve at.

4) Today, the Operational Commands are unified but the Service Systems and Material Commands that provide their

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weapons and support are not. Each service is buying many of the same types of weapons and support equipment. This allows industry to play one buyer against the other, not to mention the duplication of personnel and multiplicity of regulations and procedures that waste time and money.

What Might be Done

In brief the bottom line is that massive savings can be made in defense, at least on a one time basis. These, however, can only be realized by radical or revolutionary changes in strategy, defense policy, organization, and acquisitions policies and procedures. This is possible because in all these areas there exists a high degree of waste due to their being tailored to non-optimum solutions for political or vested interest reasons.

Defense at any level, and against any threat, is the sum of *what* we do, (defend Europe, build an SDI); *how* we do it (the strategies and tactics, and policies that govern the method of doing the defense business); and *what we have to do it with,* the forces and weapon systems that we need to do what must be done in the manner we decide. All are potential variables. Cost is largely a function of the quantity and types of the third item, the forces and weapons. These in turn depend on the jobs deemed necessary and the methods directed. Changing the jobs and methods is a less dangerous and more effective way of realizing savings in defense spending then merely cutting back on forces, weapons, and operating funds.

If we optimize defense for defense purposes only, billions can be saved or spent more efficiently to achieve better U.S. security. This will require the courage to face up to fundamental changes in policies, strategies, organizations, etc. Just possibly the Gramm-Rudman-Hollings Act can overcome the bureaucratic resistance to doing this. If so it could turn out to be a blessing in disguise.

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PETROLEUM BASED DEVELOPMENT AND THE PRIVATE SECTOR: A CRITIQUE OF THE SAUDI ARABIAN INDUSTRIALIZATION STRATEGY

By Robert E. Looney

In almost every country, industry is the glamor sector of economic development. People look to industrial development to provide much needed employment, to generate higher individual and national incomes, to relieve balance of payments constraints through import substitution, to open up markets for primary products such as those from the mining and fishing sectors, to give the country greater economic independence, to generate new tax revenues, and to furnish an important source of national pride.(1) By and large, these hoped for benefits of industrialization are desirable and realistic – provided a country makes sensible choices.

The problem facing Saudi Arabia is well known. The kingdom has to invest its current oil revenues to develop a viable economic structure for the day when its oil will have been depleted. Industrialization is one apparently attractive strategy open to the government – but this is an option which needs careful analysis.

First, industrialization does not inevitably lead to sustainable, long term growth. Based on the Iranian case, this appears to be particularly true if the process is largely initiated by expatriate companies and individuals with no permanent commitment to the welfare of the country. Industry is of no use if it forms a symbolically modern sector of the economy without developing ever-expanding linkages with the indigenous economy and culture.

Second, development economists often praise industrialization for its employment-generating effects. Yet, this should not be a high priority for the country given its small population. In the long run, non-oil related jobs will obviously be needed. In the short run, though, there may be no point in creating jobs which can only be filled by foreigners.(2)

Given such doubts, is it possible to identify an industrial strategy which is particularly suited to the special circumstances of the country? And how does the existing industrial

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strategy measure up to this ideal?

Industrial Strategy

Industrialization in the kingdom is carried out by both the public and private sectors. Because the country adheres to the concept of a free economy, the government has intervened in the industrial development of the country only when it felt it was essential for the welfare of the people. The government has been continuously encouraging the private sector to undertake industrial and other investments as a means of diversifying the economy. When the size of the investment has been large and beyond the capacity of private individuals, however, the government itself has undertaken the capital investment. A number of organizations have been established by the government to develop the basic industries of the kingdom. (3)

The Saudi Arabian government's approach to industrialization seems to have been guided by five major objectives: (4)

1. to assure the availability of essential consumer goods, free of disruptions caused by international events;
2. to lay the basis for a greatly broadened pattern of industrialization by starting the domestic production of iron and steel;
3. to assure the availability of construction materials;
4. to demonstrate to private investors the feasibility of certain industrial and mining projects by making initial investments in industries not previously carried on in the country; and
5. to assist private investment by giving suggestions, technical assistance and credit or credit guarantees.

The primary objective for industrialization is certainly the eventual establishment of an industrial production base which will reduce the country's heavy dependence on oil as its main source of income.

Diversification is aimed at developing those industries that will maintain their economic viability over the long term and includes the development of hydrocarbon vased industries and industries contributing to national security and social prosperity. To attain this goal, the government wishes on the one hand to establish in collaboration with foreign and domestic enterprise a complex of export-oriented heavy industries based on hydrocarbons and minerals with a view to exploiting the country's potential comparative advantage in this field and, on the

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other hand, to providing incentives and external economies to the private sector to establish a number of industries supplying the basic consumer and development needs of the economy, thus reducing the country's dependence on imports.(5)

These basic considerations underly most of the government's specific industrial objectives which include:(6)

1. increasing the economy's capacity to produce at competitive costs as wide a range of products as possible for domestic as well as for export markets;
2. the industrial exploitation of the substantial comparative advantages arising from low cost energy, raw materials from hydrocarbon related industry, minerals, agricultural and fishery resources;
3. widening and deepening the kingdom's access to modern technology;
4. achieving fuller capacity utilization in the private manufacturing sector;
5. developing a regionally balanced industrial sector;
6. increasing productivity through closer approach to optimal size of plants;
7. reducing dependency on expatriate workers by national skill creation, through the development of general and technical education, and on-the-job training of national workers; and
8. promoting interlinkage among industries.

The main principles of the government's industrial policy include:(7)

1. The encouragement of manufacturing industries, including agricultural industries which can effectively contribute to the increase of national income, to raising the standard of living and of employment, and to diversification of the economy. For diversifying the economy, the government will work towards the adoption of plans which, besides increasing the national income, will reduce the effect of outside economic disturbances and diversify the opportunities open to Saudi workers.
2. The principle that the economy of the kingdom is based on competition between private commercial and industrial enterprises. In practice this implies that the government realizes that the objectives of industrial development may be more effectively attained if the business community bears (in the long run) the responsibil-

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Table 1

Industrial Licenses Implemented During 1974-77

Activity	No. of Licenses	Capital[1] Paid-Up	Authorized	Employment
Food and Beverages	111	524.1	1,793.3	5,213
Textile, Clothing and Leather Products	11	46.7	132.8	1,144
Wood Products	16	73.8	160.7	1,365
Paper Products & Printing	23	73.0	185.5	1,303
Chemical Products including Petrochemicals, Rubber & Plastics	78	316.5	738.3	2,318
Construction Materials, China Ceramics & Glassware	262	2,509.3	5,685.1	16,634
Metal Products	147	515.9	1,354.6	7,502
Other Products	2	12.4	17.8	102
TOTAL	650	4,071.7	10,068.1	35,581
National	(467)	(3,009.7)	(7,201.1)	(22,859)
Joint-venture	(183)	(1,062.0)	(2,867.0)	(12,722)

[1]Capital in millions of Riyals

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ity for implementing industrial projects.

3. The assurance that businessmen who are prepared to take the risks of success and failure motivated by prospects of profits will enjoy the full support of the government during all stages of the preparation, establishment, and operation of industrial projects beneficial to the kingdom.

4. The philosophy that competition serving the interests of local consumers is the best means of influencing the business community in the industrial field.

5. The belief that the imposition of quantitative restrictions or of control on prices as a means for implementing the industrial policy will be avoided if at all possible; i.e., the government does not intend to impose restrictions except in cases in which competition cannot have an effective role (as in the case of commodities which by their nature are characterized by monopoly).

6. The right of the business community in the industrial field to select, utilize and manage the economy resources, including industrial workers, insofar as this does not conflict with statutes in force.

7. The attraction of foreign capital as well as foreign expertise and their participation in the industrial development projects in cooperation with Saudi businessmen.

8. Assurances to foreign capital that there will be no restrictions on the entry and exit of money to and from the kingdom, and that the government shall continue its policy based on the respect for private ownership required Islamic law.

9. The provision that in addition the government will attempt to promote the growth of all economic sectors suitable local resources available to producers in sufficient quantities and to ensure increasing purchasing power of consumers within the framework of an ever growing national economy.

Early Attempts at Industrialization

In view of the country's almost total lack of modern infrastructure in the early 1950s the government's first programs were devoted, in the main, to updating and expanding existing facilities, with little emphasis on new industrial investments. This period saw the rapid expansion of new road and rail networks, construction of desalination plants for drinking and

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industrial use, and the laying of the foundations for a modern communications system.(8)

In 1954 Saudi Arabia made an unsuccessful effort to incorporate the oil industry into its economy through an agreement with Aristotle Onassis whereby all Saudi Arabian oil that was not transported by tankers directly owned by the concession companies would be transported by a joint government-Onassis tanker line. The concession companies protested this action since most of their oil was transported by chartered ships. Eventually in 1958, this shipping agreement was declared to be a violation of the 1933 concession agreement by a three member arbitration board.(9)

Based on this experience, the government felt that little progress could be made in utilizing the existing oil sector as an instrument through which it could diversify the economy. As an alternative the government established its own national oil company, Petromin, in 1962 to try to attain these goals on its own.

Petromin

The General Petroleum and Minerals Organization — Petromin — was established by the government largely to develop industries based on petroleum, natural gas, and minerals. Besides prospecting, exploration and drilling, Petromin has undertaken a number of activities in the field of oil, such as oil production, refining, transportation, distribution and marketing. Petromin has initiated a number of studies to establish various hydrocarbon based industries, and since its inception has been active in many sectors of the economy.

In general Petromin has been active in three main areas:

1. development of local industry through exploration, production, purchase, sale, transportation, distribution, and marketing of petroleum and minerals;
2. ventures with other companies and/or participation in their capital so as to enter in all areas of industry as stated in 1); and
3. additional power to import any oil products or minerals as needed by Saudi Arabia.

During most of the 1960s and into the 1970s, there was a surplus of oil in the world market. Lacking foreign markets or a substantial crude supply, the company concentrated on the development of the local market.(10)

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Development by the Early 1970s

Despite these initial efforts, little progress had been made towards building up an industrial base by the late 1960s. This is evidenced by the results of several surveys beginning with the 1962 Industrial Census.(11) Unfortunately, these early surveys and census are not strictly comparable because of differences in comprehensiveness. Nevertheless, a fairly consistent picture emerges.

By the early 1970s, industry was still dominated by firms in services, trade and commerce. In general, industry was characterized by: 1) the small number of employees per establishment; 2) the lead construction had in large establishments, and 3) the high percentage of manufacturing establishments employing only 1 to 4 persons (about 90 percent).

Of particular significance was the apparent relative increase between 1967 and 1971 in the number of establishments employing 1 to 4 persons, and the drop in the number of establishments employing 100 and over.

While the industrial surveys for these years may have been incomplete in their coverage, there was in any case no clear evidence that larger establishments were becoming more predominant. In fact, the average number of workers per establishment actually dropped from 3.09 for 1967 to 2.4 for 1971. (However this drop is probably the result of the much wider coverage of cities and establishments in the 1971 census which undoubtedly resulted in increasing the number of establishments with small employment included in the survey.)

Several other features are of interest. First, the average capital output ratio (based on the 1969 census) was about 1:1. Second, wages represented one-fifth of the total production, while raw materials represented 36 percent. Third, food and beverages, and cement and non-ferrous metal products accounted for over half the total product. Together with transport equipment and wood and furniture, these branches employed 73 percent of the country's industrial workers. However, cement and non-ferrous metal products had by far the largest size per average establishment in terms of capital invested, value of raw materials, wages, value-added, and total product. Only in terms of workers per establishment does cement and non-ferrous metal products fall behind the three other branches.

Both the 1967 and 1971 census, therefore, paint a con-

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sistent picture of a very primitive industrial structure. In addition, several commentators on the period have noted that industry was still beset by a number of difficulties including: 1) a shortage of national industrial entrepreneurship as well as managerial, technical, supervisory, and skilled manpower, and 2) certain cultural influences pertaining to attitudes toward work, work intensity, incentives, and the like, which tended to depress productivity, especially at the lower skill levels.

In 1970 a survey of 294 manufacturing establishments from the largest, such as Aramco's refinery, to most of those hiring only ten people provided the first glimpse at the structure of large scale industry.

Because the large Aramco refinery was included, the Eastern Province had nearly 70 percent of the capital but employed only 34 percent of the workforce. The Western area employed nearly 24 percent of the capital and 45 percent of the workforce. The central region employed 7 percent of the capital and 20 percent of the workers. Other areas had almost no large industry even when the category required only ten workers in a plant to qualify.

The 1970 survey found that most of the plants operated substantially below capacity. Underutilization averaged 64 percent for the plants surveyed. The reason the plants failed to operate near full capaicty was not given, but presumably included shortages of skilled manpower and materials, competition from imports, and limited domestic markets. The underutilization of capacity continued into the mid-1970s for some of the important industries.

The 1971 industrial survey shows a similar pattern for that year: (12)

1. About 66 percent of all firms were engaged in commerce. Manufacturing was a poor second at 16 percent, followed by services at 4 percent.

2. While the largest number of manufacturing establishments were located in the Western Province, 32 percent of all persons employed in these firms were unpaid family workers. This percentage rose to 45 percent for firms engaged in commerce. Also for that year, one person establishments accounted for about 60 percent of all establishments, and those with less than 10 workers represented 98 percent of all establishments in the kingdom. In contrast, firms in the oil sector, while few

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in number , employed more than 50 persons each.

In 1972 a survey showed a similar pattern in that:

1. About 65 percent of all firms operated in food and textile activities. These firms were found to be small family undertakings.

2. Less than 0.5 percent of these firms employed more than 50 persons.

3. The relative contribution to the GDP of large and small firms was in reverse to their sizes.

The picture of Saudi manufacturing in the early 1970s is, therefore, one dominated by small firms. In 1971 nearly 95 percent employed fewer than five persons. These firms were essentially handicraft shops and accounted for nearly half of the employment in all of the manufacturing sector. Presumably most of these firms were smiths (working with gold, silver, brass, and iron), carpenters (making carved screens, panels, and doors), and handloom weavers (weaving products like the famous wool cloaks from Hufuf). Food processing was the final area of activity.

A second group of small scale manufacturing establishments, numbering 746 employed between five and nine workers. These shops probably had little more than simple equipment. The range of activities probably included book binding and perhaps some printing, the manufacturing of bricks and other building materials, repairing by small machine shops, food processing, and wool and metal forming.

More than one-half of the small scale industry was located in the Hejaz and northern Asir. A little over one-quarter of the manufacturing was in the central area, reflecting the growing urbanization around Riyadh and some of the oases of the Najd. The Eastern Province contained less than one-fifth of the establishments, and the northern and southern areas the remainder.

In general by 1971, the major difficulties for large scale industry were as they had been a decade earlier:

1. insufficient clarity in industrial policy and inadequacy concerning commercial and contractual relations;

2. slowness in government departments and the proliferation of agencies dealing with industrial establishments;

3. costliness of labor and the need to rely on expatriates whose visas and residence permits took an inordinate-

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ly long time to obtain;

4. costliness of imported raw materials and irregularity in their flow;

5. the large volume of capital investment required generally, owing to the inability of most establishments to enjoy large scale protection which was in turn at least partially due to the preference for imported goods in the market, and finally

6. the inadequacy of certain public facilities like electricity, roads and means of communication, and data provided by the competent government agencies.

Recent Initiatives

Since the early 1970s, the basic structure of industry has changed dramatically and is beginning to take on a more modern form. This process has been brought about by three major factors:

1. The use of formal economic planning for the development of both the public and private sectors, beginning with the First Five Year Plan (1970-75).

2. The decrees, regulations and incentives which the government uses to solicit the participation of the Saudi and foreign private entrepreneurs.

3. The tremendous economic power which the government derives from its increased oil revenues.

Before the First Plan was crystallized, certain priorities were assigned to the role of industry in the country's development. These involved:

1. The conscious decision that, wherever possible, private investment should be encouraged and furthermore supported by the supply of certain essential services by the government.

2. An impetus to move government sector investment into a number of basic heavy industries.

3. The creation of industrial estates to facilitate industrialization and at the same try to minimize heavy concentrations of industry and population, thus avoiding an overload on existing urban locations.

The sharp increase in oil revenues in the mid-1970s had removed the financial constraint on industrial development. Money was available to finance any project thought desirable. The Second Development Plan (1975-80) was prepared in this setting. Planned industrial investments amounted to the equiva-

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lent of nearly U.S. $15 billion over the plan period (excluding projects in electricity and transportation). It was anticipated that private investment would also add sufficiently to industrial investment.

Incentives for the Private Sector

Because of some hesitancy on the part of Saudi entrepreneurs to invest in manufacturing, the government has increasingly been involved in the economy through the enactment of a series of incentives designed to increase the profitability of this type of investment and/or reduce the uncertainty of the investment.(13)

Tariffs Exchange Rates, Excise Taxes: The government is committed to the preservation of free trade, to a fixed exchange rate, and to the absence of restrictions on foreign exchange or on the remittance of net earnings. In August 1974 tariffs were reduced significantly as a measure to control the cost of living. Foods, medicine, raw materials, and machinery are tariff free, but again, the tariff could reach 20 percent if it is to protect domestic industry.

Subsidies in Cash: In 1974 the government abolished taxes on fuels leading to a substantial cost reduction for business users. In addition to what might be the lowest fuel cost in the world, the government has reduced the electricity rate to SR .05 per kilowatt hour for industrial uses. The electric generating firms are, however, privately owned and in order to guarantee a fair rate of return to them, a subsidy program was initiated in 1974. The problem arose largely because the power stations are small and costs are high. Costs could be reduced by enlarging capacity, but demand is not sufficient. Guaranteeing a fair return to enlarge power stations in this case ıed to the company's claims for some sort of subsidy.

In recognition of the effect of the rising cost of construction on the willingness and ability of private investors to undertake new projects or expand existing ones, the government took it upon itself to subsidize building materials. Cement is the only subsidized material, but producers in several other areas have requested subsidies.

To enlarge expansion of farm output and improvement of farm productivity, the government administers one of the country's oldest subsidy programs. Subsidies cover a substantial portion of the cost of fertilizers and machinery.

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The government discriminates in favor of Saudi agricultural producers of government supplies by accepting their bids even though their prices may be up to 10 percent higher than the similar imported supplies.

In 1973, the government began subsidizing the importation of basic food items such as wheat, flour, sugar, and rice in an effort to reduce the cost of living. Appropriations in the first year of the program totalled SR 300 million. During 1974-75, more commodities such as milk, milk products, and vegetables were added to the list of subsidized food items. The budget appropriations have increased accordingly to SR 800 million. In addition to cement and fertilizers, these subsidized products provide the only examples of price control in Saudi Arabia.

Financial Assistance

The Saudi Industrial Development Fund was established in 1974 to finance new industrial ventures on concessionary terms. Medium to long term loans (average seven years) are granted to companies. The Fund's program to date has taken on a specific orientation:

1. Loans are made to companies able to demonstrate a likelihood of their products being financially and economically viable and fitting the government's development criteria.
2. Capital and energy intensive projects are encouraged; labor intensive projects are looked on with less favor.
3. Funds covering up to 50 percent of a project's capital requirements are lent at a cost of around 2 percent a year.
4. The government is reluctant to impose new tariffs although it does grant in special cases protection up to 20 percent.
5. Incentives and subsidies in the form of low interest rates, low utility rates, low tax rates are the preferred methods of channeling funds into the industrial sector.

During the period 1974/75 to 1978/79, the Fund approved 506 industrial loans involving a total amount of SR 5,416 million. The loans disbursed during 1978/79 amounted to SR 1,117 million, thus raising the total loan disbursements to SR 3,414 million.

To support the activities of SIDF, the Industrial Studies Development Center (ISDC) has undertaken a number of feasibility studies to identify projects likely to be attractive to

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the private sector.(14)

The criteria used to determine likely candidates for investment are based on ISDC's perception of the inclinations of Saudi entrepreneurs. ISDC's view of investor preferences is that:

1. Demonstration of existing demand plays a fundamental role in assuring investors of the absence of risk. Because Saudi businessmen are conservative by nature and tradition, it is logical that they would prefer import substitution type industries.

2. In responding to the government's incentives, projects that display externalities or linkages on both the supply and demand side would be favored by the private sector.

3. Saudi entrepreneurs are profit maximizers. It is thus assumed by ISDC that throughout the massive program of government assistance and expenditure, private investors will find that an expected yield of at least 20 percent rate of return on investment is sufficient inducement. This rate is assumed to be fair in comparison with returns on conventional alternative uses such as commerce.

A second important financial development has been the establishment of the Public Investment Fund (PIF). This organization was established in 1971 to meet the credit requirements of public corporations engaged in commercial or industrial activities, especially Petromin and SABIC. Cumulative loan disbursements by the Fund between 1972/73 and 1978/79 reached SR 10, 812 million while domestic and foreign investments stood at SR 4,750 million and SR 973 million, respectively.

Industrial Estates

One of the most helpful facilities provided by government to the private sector to encourage industrial expansion has been the establishment of industrial estates which besides allocating land plots at nominal rates are also equipped with utilities, workshops, transportation facilities, communications channels, banks and other necessities. The Riyadh, Jeddah and Dammam estates have witnessed considerable expansion. The area of the Riyadh estate has been expanded from 451,028 square meters to 21,000,000 square meters; that of Jeddah estate from 1,044,008 square meters to 9,100,000 square meters; and that of the Dammam estate from 994,653 square meters to 24,000,000 square meters. Work is in progress for setting up industry in Mecca, Qasim, Hafuf, Medinah, and Abha.

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Sudsidies in Kind

The ambitious nature of the government programs to develop the country's social and economic infrastructure are evident from the size of government expenditure. These programs lower business costs significantly.

The government has established industrial parks in major industrial and trading zones of the country. These estates are planned to provide all basic infrastructures essential to business firms; i.e., water, electricity, telephone, banking, post office, police, and fire protection services. Lots in these industrial parks are available to prospective users at a nominal rent.

Several institutions provide research, consulting, and training services to the business sector either free or at a nominal cost. ISDC vocational training institutions and agricultural extension services are part of this effort.

Licensing

Licensing is obligatory for new or joint industrial projects. Saudi firms who expect to seek government protection and assistance must also be licensed. Government licensing provide assurances prior to the undertaking of feasibility studies, that the projects will contribute to plan fulfillment.

Taxes

Saudi business firms pay a tax called Zakat at a rate of 2.5 percent on their wealth.(15) Except for that, there are no property, income, or sales taxes on Saudi firms. Because most small businessmen do not keep accurate records and the consequent difficulty of auditing by the tax authorities, most of these firms end up paying little or no tax. The light burden of this tax and the absence of other taxes makes business an attractive activity which seems to be in line with Moslem tradition.

Non-oil foreign businesses, however, pay income tax at a rate of 25-45 percent on net income. Oil companies are taxed at a higher rate of 55 percent on net operating income. Joint ventures, with at least a 25 percent Saudi share, are granted a tax holiday for five years commencing from the production date. Qualifying joint ventures, according to the foreign investment law, enjoy all "other" advantages granted to Saudi firms.

It is apparent that taxes payable by the Saudis are an inef-

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fective instrument for changing the pattern of resource allocation. It is perhaps for that reason that the government relies more heavily on negative taxes rather than subsidies in its effort to increase the non-oil GDP. As for foreign business firms, the tax breaks which they are entitled to are highly conducive for those firms with Saudi participation. Currently, there is an effort under way to reform the rules for the taxation of foreign companies to accelerate foreign participation in development projects.

Other Incentives

Aside from government policies Aramco has perceived the need for support industries.(16) That company has identified opportunities and assisted prospective entrepreneurs in establishing enterprises in construction, mechanical and maintenance contracting, transport, offshore servicing, catering, and many other fields related primarily to the company's own needs.(17)

After 1973 the enormous investment in government revenues rapidly disseminated to the populace encouraged a boom in construction and consumer goods, and thus created a sufficiently substantial market to interest local merchants in establishing import substitution industries.

Industrial Growth

Encouraged by the government's policy of providing services, subsidized plots in industrial estates, cheap power and inexpensive finance, and benefitting by the appalling delays in landing goods in 1976-77 due to port congestion, private Saudi firms responded with an unprecedented wave of activity. In the 1974-77 period alone, over 600 new industrial plants were initiated and in the implementation stage (Table 1).

As a result of this growth, Saudi Arabia is now virtually self-sufficient in the principal building materials: production of cement, clay concrete and sand lime bricks, tiles, aggregate, precast concrete and prefabrication systems, doors, windows, and a number of other items. The same applies to screws, steel, scaffolding and reinforcing mesh, fencing, insulation materials, air conditioning and desert coolers. Because of their high ratio of volume and weight to value, many of these items were obvious choices for local production. More recently, emphasis has been placed on consumer goods. Foodstuffs (represented by modern dairies, bakeries, soft drink plants, date packing and

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meat processing facilities, household goods (plastic bags, containers, detergents, insecticides, and other chemicals, furniture and furnishings, household applicances (such as refrigerators), all contribute to lessen dependence on the importation of such items of consumption.

Conclusions

The future, while very bright for the private sector, will not take care of itself, however. Certain difficulties exist and numerous obstacles to change exist. The most serious difficulties center around the fact that:

1. Reliable statistics on current output, investment, employment, and industrial capacity are not available. While there have been several censuses of manufactures, these censuses are out of date and the new ones kept confidential.
2. Government machinery operates weakly with an occasionally competent individuals presiding over a cumbersome and inexperienced administration apparatus.
3. Private businessmen have not yet learned to operate effectively developing schemes as government laws and incentives change rapidly.
4. Few government people are familiar with the mechanics and problems of industry.
5. Nearly all planning activity is centralized in Riyadh, with a consequent limiting effect on the planners' perspectives. Overcentralization is not a fault of the planners' approach to their task; it simply reflects the historical policy of not allowing local government and private interest groups to become too strong.
6. And finally, the limited size of the market makes it difficult to foresee a long vigorous growth in import substitution projects, since many of the available sectors, particularly in building materials, are now in a domestic supply-demand equilibrium. In foodstuffs, plastics, chemicals, and metal working opportunities still undoubtedly exist.

Increasingly, however attention must be focused on export possibilities using feedstock from the large petrochemical plants planned for Yanbo and Jubail. The extent to which downstream export factories will be erected depends upon the government's approach. By maintaining a cheap capital and energy supply, and by subsidizing the necessary raw materials, many possibilities will undoubtedly present themselves.

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FOOTNOTES

(1) Ali M. Jaidah, "Downstream Operations and the Development of OPEC Member Countries," *Journal of Energy and Development* (Spring, 1979), p. 305.

(2) Points clearly articulated by Louis Terner. See his "Industrial Development Strategies in the Arab Gulf States," in May Ziwar-Daftari, ed., *Issues in Development: The Arab Gulf States* (London: MD Research Services Limited, 1980), p. 210.

(3) Industrial Studies and Development Centre, *A Guide to Industrial Investment in Saudi Arabia,* Fifth Edition (Riyadh: ISDC, 1977), p. 35.

(4) Ibid.

(5) Cf. "Saudi Arabia Moves to Diversify Economy: Industrial Development Has Priority," *Arab Economist* (August, 1977), pp. 24-29.

(6) *A Guide to Industrial Investment in Saudi Arabia,* op. cit., pp. 35-36.

(7) Ibid.

(8) Ramon Knaverhase, "Saudi Arabia's Economy at the Beginning of the 1970s," *The Middle East Journal* (Spring, 1974), pp. 126-127.

(9) Fariborz Ghadar, *The Evolution of OPEC Strategy* (Lexington, Massachusetts: Lexington Books, 1977), p. 108.

(10) Ramon Knaverhase, *The Saudi Arabian Economy* (New York: Praeger Publishers, 1975), p. 144.

(11) The results of the early census may be found in Central Department of Statistics, *Statistical Year Book,* various issues.

(12) Ibid.

(13) The following list of incentives is based largely on information contained in: Saudi Arabian Monetary Agency, *Annual Report,* various issues; The Industrial Studies and Development Center, op. cit.; and Industrial Studies and Development Center, *Non-Oil Manufacturing in the Private Sector: Present Conditions and Projections for the Second Plan* (Riyadh: ISDC, 1974).

(14) A.M. Sharshar, "Oil, Religion and Merchantilism: A Study of Saudi Arabia's Economic System," *Studies in Comparative International Development* (Fall, 1977), p. 54.

(15) Details are spelled out in: Zakat and Income Tax Department, *Regulations for Income Tax, Road Tax, and Zakat* (Riyadh, Ministry of Finance and National Economy, 1978).

(16) Joseph Malone, "Building a Constituency: Non-Petroleum Activities and Programs of the Arabian American Oil Company," paper presented at Center for Arab Gulf Studies, University of Exeter, State, *Economy and Power in Saudi Arabia* (Symposium, July 4-7, 1980), pp. 18-19.

(17) Through Aramco's Local Industrial Development Department, Cf. Emid Hill, "Saudi Labor and Industrialization Policy in Saudi Arabia," paper presented at Center for Arab Gulf States, University of Exeter, *State, Economy and Power in Saudi Arabia* (Symposium, July 4-7, 1980).

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THE SIBERIAN GOLD MINES

By Wladyslaw John Cieslewicz

In the chaos created by the Socialist Revolution of 1917, the Bolshevik leaders who gained control over the former Russian Empire faced severe economic problems, and turned to the mining of Siberian gold to shore up their Marxist economy. To achieve this, they employed vast quantities of slave labor, and some 5 to 7 million captives, mostly of non-Russian origin, were sent to Siberia between 1931 to 1957 to labor in the goldfields. There the overwhelming majority of them died. The main camps employing slave labor were and still are located in the Kolyma goldfields, first discovered in 1928. "Kolyma znachit smert'" – "Kolyma means death" – such was the universally known sinister reputation of Kolyma among the captive nations of the Soviet-controlled territories of Latvia, Azerbaijan, Uzbekistan, Moldavia, Kazakhstan and elsewhere.

Western governments and the Western news media knew about Kolyma but they suppressed information and even misinformed the public. Scores of American business organizations as well as individual professionals collaborated with Soviet socialist agencies such as the Soiuz-Zoloto, the State Gold Monopoly, that operated the gold mines jointly with the Dal'stroi. Let us survey the operation in its geographical and historical setting.

General Geological Setting of Russian Gold

Gold distribution throughout the vast territory of Socialist Russia and her contiguous colonies is controlled by four geotectomic megazones. The most important one of these comprises following four metallogenic provinces located along the peripheries of the stable Siberian (Angara) Shield: Yenisei Ridge, the Balkaloids, Okhotsk-Mongolian belt and the Mesozoids of northeast Siberia. individually these provinces experienced diastrophism at different geological times, some of them more than once. The second megazone is the Hercynian (Mississippian-Permian) orogenic belt made up of the mountain ranges of the Urals, Mugodzary, Sian, Tian-Shan and Altai. The remaining two auriferous geotectonic megazones were, in the past, less important as gold producers. One of them is the Pacific tin and gold belt, strongly volcanogenic and made up of the Okhotsk-Chukotka and Sikhote-Alin mineralogical prov-

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inces. The other is the young Alpine system which, in Soviet-controlled territory, consists of three widely separated sectors: the Eastern Carpathians, the Caucasus and the northern slopes of the Pamirs.

Let us very briefly characterize the important individual auriferous metallogenic provinces.

The Yenisei Ridge is a chain of low mountains stretching south-southeast to north-northwest along the east banks of the Yenisei river between Krasnoiarsk to the south and Podkamennaia Tunguska river to the north. This metallogenic element represents tectonically disturbed southwest edges of the Siberian shield that abut against the mobile belt of the Western and Eastern Sian mountains. All gold lodes and veins in this province are in Pre-Cambrian rocks. Some of the richest gold lodes and placers have been found here in the past.

The Balkaloids of South Central Siberia are structures located along the great Baikal rift. This zone of crustal weakness strikes from southwest to northeast; it is some 1300 km long and 270-450 km wide. Many of the deep fractures in this zone have been reactivated repeatedly. Gold mineralization is therefore of different ages, from Pre-Cambrian to Tertiary. Gold occurs in quartz viens, with sulfides, in metamorphic rocks and in volcanic. The Baikal rift cut diagonally several high mountain ranges, thus gave rise to several interior basins in which many very large gold placers were buried. The rivers Lena, Vitim, Olekhma and Aldan as well as their tributaries are now re-excavating some of these alluvial deposits creating in the process placers of their own. The largest Quaternary gold placer in all of Russia was found here at Bodaibo in the Vitim-Lena basin (Kazakevich, 1973, pp. 57, 66).

On the southeast side, the Siberian shield is bordered by another gold metallogenic province: the Okhotsk-Mongolian folded belt (Moisenko 1974, p. 87). Here, too, gold mineralization of different ages occurs along zones of deep fractures. The great Aldan-Olekhma placers were derived from rocks of both Pre-Cambrian and Mesozoic ages. In the same area lies also the unusual Nizhnyi Kuranakh gold deposit. Residual gold-bearing quartz of post-Jurassic age was found here together with sands and shales in karst developed in Cambrian limestones.

The Mesozoids of Kolyma and northeast Yakutia constitute the last and richest auriferous metallogenic province found along the edges of the Siberian shield. They form the so-called

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Yana-Kolyma folded belt, a series of mountain ranges extending from southeast to northwest across the entire northeast Siberia.

The rocks are mostly sandstones, shales and volcanics of Triassic and Jurassic age. Structurally Mesozoids represent the folding stage of the geosynclinal cycle. In the Upper Jurassic the Mesozoids were cut by porphyritic gold-bearing dikes which intruded along major fault zones (Ustiev, 1972). Areas away from these deep seated faults are barren. Zones of impregnatism also developed in the shales. Subsequent uplift and erosion of these Mesozoid structures gave rise to the present-day gold placers. Because of the aforementioned regular structural control, the gold placers of Kolyma and northeast Yakutia occur in characteristic banded pattern. The placers are very young, some formed in the Pleistocene. Russians claim that in virgin state they contained highest gold concentration of any known placer province in the world.

With the second geotectonic megazone, the southern half of the Ural mountains has been a significant gold producer. The Urals are made up chiefly of Pre-Cambrian schists and Early Paleozoic sediments with some volcanic tuffs and lavas. During the Hercynian orogeny these rocks were intruded by both basic and acidic igneous rocks. Gold mineralization, mostly veins and lodes, is generally associated here with granite intrusives. Gold occurs in quartz veins with sulfides. Some lode deposits are associated with metamorphosed extrusive rocks. The majority of the south Ural placers were formed during the Tertiary and Quaternary epochs. This gold-bearing province stretches for over 1000 kilometers from south to north.

The great Muruntau deposit in the Kyzyl Kum desert of Central Uzbekistan also lies in this Hercynian metallogenic belt. Here gold mineralization is disseminated through large zones of quartz schists along major faults.

History of Russian Gold-Mining

In Russia, grave robbers were the first "discoverers" of gold. At the beginning of the 18th century, in the Ural Mountains, they dug out gold artifacts from the burial mounds of the ancient inhabitants of the region. When Tsar Peter I (1672-1725) heard about it, he issued an ukase forbidding under penalty of death further pilferage of the graves by the local populace. Whereupon, he promptly sent his own men to carry on this work (Lokerman, 1978, p. 15).

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Tsar Peter I did, however, encourage prospecting for minerals, especially for gold and silver. In 1719 he decreed the *gornaia svoboda*, a law granting power of eminent domain to anyone to enter upon, prospect, mine and smelt metal ore on any land regardless of who owned it. This right remained till 1782, when it was severely restricted by Catherine II.

Regular, organized gold mining developed in the second half of the 18th and early 19th centuries in the Central Urals. In 1745 a Russian peasant, Erofei S. Markov, the "father" of Russian *starateli,* the gold prospectors, found the first rich lode at Berezov, northeast of Sverdlovsk (Maksimov, 1971). Early mining of gold veins and lodes concentrated there, also at Plast, southwest of Cheliabinsk in the Perm area. By 1800 some 50 hard-rock gold mines were active in the Berezov district alone.

Until 1814 Russian gold prospectors, both government and private, looked only for deposits of vein and lode type. The idea that alluvial placers could form gold deposits worth mining was still not seriously considered in Russia (Lokerman, 1978, p. 75). This misconception delayed the development of gold mining in Russia probably for 150 years.

In Russia, Lev I. Brusnitsin, a miner in the old Berezov gold district, was the first man to correct this incredible error. Brusnitsin's simple discovery in placer mining opened a new era of gold prospecting and mining in Russia. Within a few years numerous gold placer deposits were already found in the Central Urals and started to produce. Soon thereafter began the great eastward shift of Russian gold exploration across Siberia in search of new placer deposits. Initially this activity was promoted by the brief restoration in 1812 of miner's rights of eminent domain. Gold production increased dramatically. Between 1754 and 1813 Russia produced only a total of 8 tons, between 1814 and 1861, it produced 620 tons (Levchenko, 1978, p. 26). The eastward movement to Siberia was to continue for almost 150 years, and it took place in 5 or 6 stages.

By 1897 the tsarist government finally had enough gold to place the Russian ruble on the gold standard. Among approximately 40 companies that worked the Lena basin, the largest was the British-owned Lena Gold Fields Ltd. It was this company that really introduced mechanical methods of placer mining into Russia. By 1913 Lena Goldfields operated 47 mines in this region, producing some 12 tons of gold annually.

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Gold Mining Following the Socialist Revolution

During the Revolution, the Socialists purposefully resorted to hyperinflation in order to debase the Russian ruble. The old Socialist theoretician Mikhail Bukharin put it in these words: "The Socialist government must use the money printing presses as machine guns to attack the bourgeois system from the rear." Gold was denied any monetary role in accordance with Lenin's dictum that after the Socialist victory gold bricks would be used as tiles for the lavatories of the victorious proletariat (Dallin, 1947, p. 146).

However, as soon as the Marxist regime had consolidated its power, the restoration of a sound ruble became the first order of the day. Under the New Economic Policy (NEP) of 1922, Russian currency was placed again on a partial gold standard. Each ruble in circulation was to be backed up to 25% by gold or by gold convertible hard currency.

In 1921, the Soviet Socialist government decreed speedy restoration of gold and platinum mining. Large geological exploration parties were organized and instructed first to re-examine older gold mining districts and, then, to carry out expeditions to entirely new regions, especially in Siberia. The first convention of the Russian gold mining industry was held in 1926 (Bolshaia Sovietskaia Entsiklopedia, 1972).

Also, in order to enlist the help of the Western countries in this effort, Lenin tried for the first time "détente." This strategem was later to be repeated by his successors not less than nine times. "The détente" doctrine as used by the Soviets was always based on Lenin's perceptive appraisal of the capitalist enemies. In Lenin's words, "when the time comes for us to hang the remaining few capitalists, they themselves will compete with one another to sell us the rope on credit" (Lenin, 1920). Bolshevik leader Bukharin openly made similar statements during the NEP era (Sutton, 1971, v. II, p. 27).

In the early 1920s British controlled Lena Gold Fields Ltd. was again invited to reactivate its placer mines at Bodaibo. The company brought in from the West much new equipment including a large modern Bucyrus dredge. No sooner were the mines restored to full operation when the Lena Goldfields was forced out of Russia, its mines and equipment all seized with little compensation (Sutton, 1971, v. II., p. 27).

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Kolyma's Gold and the Death Camps of Dal'stroi

Kolyma gold placer deposits were discovered in 1928. This discovery came at an opportune time for the Russians. After the Revolution of 1917 they decided, as a preventive and terror-inspiring measure, to neutralize the non-Russian captive nationality groups of Ukraine, Transcaucasus and Central Asia by removing political activists to Siberia. The mining of gold in the Arctic North was to benefit from this process (Anders, 1949, p. 73). As a method of extermination of political enemies the Dal'stroi operation proved to be profitable. In Kolyma, it was calculated that a prisoner would have an average life expectancy of only one to two years after arrival at the mine, during which time he would produced between 1.5 and 2 kg of gold for the Soviet treasury (Dallin, 1947, p. 146). At one time, Karl Marx had defined capital as the "congealed labor of the exploited proletarian workers." In Kolyma, the Socialists made the metaphor a reality. The *vis vitae* drained from the deported Ukrainians, Kazakhs and prisoners of other nationality groups quickly congealed at the mine into the purest form of capital, namely gold.

In preparation for this 'great Kolyma gold rush" the Russians completely re-organized the government agency in charge of gold mining, the Soiuz-Zoloto, the State Gold Monopoly. In 1927 Professor Aleksandr Serebrovskii, originally from the Moscow Academy of Mining, was appointed as the new director of the Soiuz-Zoloto. According to reports, Serebrovskii, the former Bolshevik boss of the Russian petroleum industry, was a true Socialist Stakhanovite (Levchenko, 1978). He organized the training of thousands of reliable Marxist technicians to direct the slave labor at the mines. With help of the executives of the Standard Oil Company and of the American Ambassador in Paris, Serebrovskii was able to come to the U.S. to examine modern placer mining technology and to recruit for the Soiuz-Zoloto a number of American placer mining engineers from Alaska and California (Littlepage, 1939, p. 31). The workers for the Soiuz-Zoloto placer mines were supplied by the GULAG. The latter, a Russian abbreviation for the Chief Labor Camp Administration, was the state agency in charge of all Socialist concentration camps.

By 1933 the Soiuz-Zoloto was able to rehabilitate hundreds of old mines and to place dozens of new ones in production.

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During the five year period between 1927 and 1933, Russia's gold output rose spectacularly. It surpassed that of the U.S. and Canada; only South Africa produced more gold. In 1935, Russian gold output reached 6.2 million troy ounces (Emmons, 1937). In 1940 the gold production of Kolyma alone was probably close to 10 million troy ounces (Anders, 1949, p. 76). Likewise, after 1929 the Soiuz-Zoloto disbanded all private prospecting parties, the "cartels," replacing them with forced labor.

Simultaneously with the launching of the new "great Siberian gold rush of 1929," Russian Socialist terror police, the NKVD (the predecessors of the KGB), exerted a massive effort to confiscate all private gold. About a half a million people were arrested on suspicion of gold ownership. Jewelers, watchmakers and dentists suffered in particular during the gold purge of 1929. Many who had no gold are reported by Solzhenitsyn to have fared the worse; being unable to give up what they did not have, literally tortured to death by their NKVD interrogators (Solzhenitsyn, 1974).

After 1931 the government intensified its policy of sending non-Russian captive peoples suspected of patriotic intentions to the Siberian labor camps (Bron, 1981, p. 10). For that purpose, a special organization, the *Dal'stroi,* was established in Kolyma. The name Dal'stroi was the Russian abbreviation for Far East Construction. It was run jointly by the Soiuz-Zoloto, the NKVD and the Red Army. From 1938 on, this organization was also responsible for geological exploration work throughout the entire Magadan Province and Northern Yakutia, in other words in all of northeast Siberia (Ustiev, 1972). During its existence between 1931 and 1957, the Dal'stroi brought to Kolyma, Northern Yakutia, and later also to Chukotka, a total of 5-7 million slave workers, practically all of whom ultimately died in the gold and tin mines.

The policy of extermination pursued by the Russians was well illustrated in the fate of the Polish population during the 1939-1945 war. Altogether some 2 million Poles were deported or imprisoned in Russia or Siberia. In the fall of 1941, the Soviets agreed to free these Poles, on the understanding that they would assist in the Soviet war against Germany. The Polish Free Government, then in London, started to organize in Uzbekistan a Polish Army made up of these ex-prisoners. But of the 2 million deportees, only about 160,000 reported at

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the Polish military camps. Of the 10,000-12,000 soldiers sent in 1940 to the death camps of Kolyma, only 171 came back, and of the 3,000 sent to Chukotka, not a single Polish POW returned (Anders, 1949).

The first prison camp of Kolyma was set up in the Nagaev Bay to provide slave labor for the construction of the port city of Magadan. After 1931, the number of prisoners brought each year to Kolyma varied from 300,000 to 400,000 (Dallin, 1947, p. 137). Prisoners lived in make-shift barracks at the individual "priiski," the State Placer Mines. In Kolyma the customary barbed wire camp enclosures and watch towers were usually unnecessary. There was no escape from this remote taiga at the Arctic Circle. Soviet guards used trained wolf-hounds to track down those few prisoners who attempted escape through this vast and severe terrain (Dallin, 1947, p. 124).

After the discovery of rich tin placers at the Valkumei in the Chaun Bay area, near the Chukchi Sea, and the Yul-tin placer in NE Chukotka near the Bering Straits, new labor concentration camps were established at these tin and gold placers. To reach such remote mines, prisoners were driven on foot over the ice pack roads from the Arctic ports in Kolyma and Chukotka. Practically all mining was done by hand. A former official of Dal'stroi, V.A. Berzin, described the operation as follows: "Picks, shovels and wheel barrows were the only tools the laborers of Dal'stroi had to work with, and they worked year round, even in the winter at temperatures of 60°C below zero" (Levikov, 1971, p. 12). "The placer mines looked like gigantic anthills, swarming with hundreds even thousands of people digging, loading and carting away the overburden" (Levchenko, 1978). During the summer washing-season, each prisoner had to load and carry in the wheelbarrow, 9.3 cubic meters of gravel per day from the pit to the heap up to 100 m away. Piles of gravel were then washed by other teams of prisoners. The production norm for the teams working on the washing installation was fixed at 200 grams of fine gold per man per day. During the long Arctic nights, the prisoners had to blast frozen gravel before they could load it on the wheelbarrow. In the washing season, from mid-May to mid-August, the daily norm was 120 full wheelbarrows (Krakowiecki, 1950).

The prisoners, generally hungry and always cold, dressed in rags with shoes improvised from shreds of gunny sacks or pieces of old rubber tires, worked in the daylight, and also during the

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long winter nights, 16 hours a day. They received 600-800 grams of bread, hot water in the morning, and a watery soup at night. That was all! The so-called "dokhodiagi," the dying, who were too weak to meet the daily work norm, had their bread rations reduced (Krakowiecki, 1950). Lenin decreed: "Kto ne rabotaet, tot ne kushaet" ("no work, no food"). As a result, most prisoners died at the mine, and were buried in the gravel (Petrov, 1949). The bodies of these early victims, usually perfectly preserved in the permafrost, are caught daily in dragline buckets and bulldozer blades, interfering with the present mechanical re-working of the "technogenic" placers of Kolyma.

During the Dal'stroi period, 1931-1957, northeast Siberia became the "monetnyi dvor," the mint, of Socialist Russia. According to one source, between 1937 and 1946, the Dal'stroi prisoners produced 250 tons of gold (Anders, 1949, p. 76). By 1948 northeast Siberia accounted for 85% of Russia's total gold production.

Following the exhaustion of rich surface placers at many mines, the prisoners were required to hand-work the underground channel placers by the primitive and dangerous "shaft-a-drift" method.

The Dal'stroi continued in existence until 1957. After that year most of the gold mines in northeast Siberia were shut down and remained closed until 1966. During that decade relatively less gold mining was carried on in the Soviet Union, but since then, Kolyma and the other major Russian gold mining areas have revived. The author estimates in Koylma today, some 50 old State Placer Mines, the "priiski," grouped in six mining districts, the "combinaty," are once again being worked actively (Cieslewicz, 1973).

The Role of Western Engineers

According to Sutton (1971, v. II, p. 47), between 1929 and 1933 American engineers ran much of Russia's mines and nonferrous industry.

One such worker was John D. Littlepage, an American placer mining engineer. The facts presented here are taken from the book he wrote upon returning from the Soviet Union (Littlepage, 1938). In 1927, Littlepage was recruited by Serebrovskii to work for the Souiz-Zoloto. He accepted Serebrovskii's offer because the pay was two to three times higher than

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the salary he was earning in Alaska. Several years later, on the orders of Serebrovskii, he came to the U.S. to persuade another 10 American mining engineers to join him at the Soiuz-Zoloto. He reported that he "had no trouble in finding first-class American mining engineers to come to Russia" (p. 61).

In the USSR, Littlepage went first to the Urals, where he helped the Marxist government to reactivate some of the old gold mines. He then organized a program for mine technicians at the old Kochkar mine near Cheliabinsk in the Urals. Later, Littlepage became a troubleshooter for the Soiuz-Zoloto, solving production problems at the different mines. In his book, Littlepage has nothing but praise for Serebrovskii. He calls the Soiuz-Zoloto, "a model Soviet trust" (p. 157), and reserves his criticism for the old Russian mining engineers who in these early days of Socialist rule still occasionally engaged in acts of industrial sabotage. Littlepage makes some reference to the slave laborers from the death camps: "I had former priests and Mohommedan holy men working for me on more than one occasion. Some of them turned out to be excellent miners" (p. 134).

Littlepage attained one of the highest positions in the Soiuz-Zoloto organization. He became the deputy chief engineer responsible for gold production through this entire far-flung Soviet state run gold monopoly. Finally, in 1935, at the peak of one of the greatest Socialist purges in Russia, which – by the way claimed even the life of Serebrovskii himself – Littlepage was summoned to the Kremlin to receive one of the highest Socialist decorations, namely "The Order of the Red Banner of Labor" (p. 207). In 1938, after 11 years of loyal service to the Soiuz-Zoloto forced labor camps, Littlepage and his family returned safely to the United States, much wealthier than when he left.

Many American companies also helped the Soviet regime rebuild and develop their industry, including gold mining. After 1917, the following companies were amongst those that offered technology to the Marxist government or provided loans to pay for it: Chase National Bank (later Chase-Manhattan); International Harvester; Allied American of Julius Hammer, one of the founders of Communist Party, USA; later, Occidental Petroleum of Armand Hammer; General Electric; Ford Motor; Dupont; Radio Corp. of America; Caterpillar Tractor;

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American Can; Standard Oil of New Jersey; and Alcoa (Draper, 1957, p. 422; Sutton, 1968, v. I and 1971 v. II., numerous pages of references). Today the Soviet government acknowledges this contribution: "Foreign capital enabled the Soiuz-Zoloto to reactivate many remote gold mining districts such as those of Lena Basin and to develop new areas such as the Aldan" (Levchenko, 1978, p. 49).

In their quest for gold, the Soviet regime also received cooperation from other Western governments. It took many forms. The Spanish Socialist government, for example, handed over its gold to the Soviets, when in 1936 Stalin ordered the Spanish Republicans to transfer the accumulated gold reserves of the Spanish treasury to the Soviet Union. The then-President of Spain, Manuel Azaña, and the Finance Minister, Juan Negrín, both Socialists, promptly complied. During the nights of October 22-24, the Republican Red guards loaded 510 tons of gold (three-quarters of the entire national reserve) onto Russian ships at the Spanish port of Cartegena, which then took it to Odessa in Ukraine. On that occasion Stalin allegedly boasted: "Spain will never see its gold again." Indeed, 49 years later, Spain is still waiting for it (Settgast, 1975).

Between 1945 and 1947, English and American military authorities returned by force, often at bayonet's point, somewhere from 2 to 3 million Ukrainians, Kalmuks, Crimean Tartars and Russian POWs found in the West at the end of World War II (Epstein, 1973, pp. 24-39; 93-94). This forced repatriation campaign, carried out under the secret military code name "Operation Keelhaul" was ordered by the U.S. War Department under General George C. Marshall, and was carried out with the consent of the State Department (Secretaries Edward R. Stettinius and James F. Byrnes), and with the full cooperation of the United Nations Refugee Agency (Director Herbert H. Lehman). Concurrently, the British War Department and Foreign Office carried out their own "Operation Keelhaul" (Epstein, 1973, pp. 47-50). The gratuitous promise, given to Stalin by Churchill and Roosevelt at Yalta, was thus kept (Epstein, 1973, p. 23). The Soviet authorities executed some of these returned persons, and sent the rest of them to the death camps of Soiuz-Zoloto (Dean, 1947, p. 293).

The Suppression of the Kolyma Story in the West

During the Roosevelt Administration few facts about the

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Russian death camps at the gold mines of Kolyma, Yakutia and Chukotka received any publicity in the USA. In 1943, Roosevelt sent Vice President Henry Wallace on an official mission to report on the grim rumors about Siberia. Wallace stopped at Magadan, visited the forced labor camp "Bolshevik" at one of Kolyma's gold mines, then he flew on to Irkutsk. On his return to the United States, Wallace published a book entitled, *Soviet Asia Mission* (Wallace, 1946). He had warm praise for his host, NKVD General I.F. Nikishov, the then commandant of all Dal'stroi death camps. The U.S. Vice President claimed that "In the North Siberia today [1943] Russians have developed urban life comparable in general to that of our own Northwestern States and Alaska" (p. 72). The Dal'stroi organization was portrayed by Wallace as being the equivalent of "our Tennessee Valley Authority." From his trip to Irkutsk, at that time one of the three administrative centers of the Siberian death camps, Wallace recorded these impressions: "It was Trinity Sunday, June 4, and the Russian people were celebrating it by walking in the sunshine. The factories were closed, as is usual on Sundays, so the workers could go out and tend their gardens. It was restful to hear the people singing as they strolled along the riverside, the youth playing accordions. In their folk songs one feels the stirrings of the Russian peasant soul..." (p. 123). Similar descriptions can be found in the American press of that time. For example, *Life Magazine* (March 29, 1943) writing about the NKVD police in charge of Dal'stroi and the GULAG prisons in general, portrayed them as the equivalent of the American FBI.

In December 1944, the *National Geographic Magazine* published a lengthy article by Professor Owen Lattimore, compiled after his return from a State Department-sponsored visit to Siberia (Lattimore, 1944, pp. 641-658). In Kolyma, Lattimore became acquainted first hand with the Dal'stroi organization, and described it as "a combination of Hudson's Bay Company and TVA." At Magadan, the headquarters of the Dal'stroi, Lattimore noticed that "the wharves in the port were stocked high with American equipment." He also enjoyed "a first-class orchestra and a good light opera company" while at Magadan. About his host, NKVD General Nikishov, the commandant of the death camps, Lattimore remarks: "Mister

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Nikishov, the Head of Dal'stroi, had just been decorated with the Order of Hero of the Soviet Union for his extraordinary achievements. Both Nikishov and his wife have a trained and sensitive interest in art and music and a deep sense of civic responsibility." About the gold fields themselves, where at that very time up to 400,000 prisoners were being worked and starved to death each year, Professor Lattimore wrote: "We visited the gold mines operated by Dal'stroi in the valley of Kolyma River. Instead of the sin, gin, and brawling of an old-time gold rush, we found extensive greenhouses growing tomatoes, cucumbers, and even melons to make sure the hardy miners got enough vitamins!"

We get a different picture of the NKVD and Socialist death camps from the few ex-prisoners who managed to escape or otherwise survive and live to write about them. One such book, *The Long Walk*, by S. Rawicz, describes the transport of 4000 prisoners in the middle of winter in unheated freight cars from Moscow to Irkutsk, and the death march that followed. At the point of his story where we find the prisoners being detrained: "The [Red Army] soldiers walked down the train removing seals and unbarring freight cars and ordering: All out! We stumbled out and the shrieking, whipping wind and a subzero temperature made us gulp and gasp...we shivered uncontrollably. It was the second week of December and Siberia was frost-bound in winter. We met it ill clad only in a pair of trousers, canvas shoes and a thin cotton blouse. Only on the third day in an open potato field, buried under two feet of snow, the prisoners were finally given an issue of winter clothing (Rawicz, 1956, p. 40). The author continues: "On the fourth day a whole convoy of some sixty powerful lorries drove into the field...[Red Army] soldiers were detailed into sections of about 20 men, each section disposed to guard 100 prisoners strung two abreast behind each lorry....From each lorry was uncoiled a length of heavy steel chain. A soldier walked between the two men at the head of each column forcing them apart and then walked through the middle cleaving the prisoners into single lines. Other soldiers followed him running out the chain...Then 50 men a side, we were handcuffed to these chains by one wrist. The forward end of each chain was secured to a strong hook attached to the rear of each lorry. The troops piled quickly into the back of the lorry. We were ready to start. The procession began to move, the lorry at the head setting the

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pace....We trudged non-stop through the first night for 12 hours or more" (pp. 42-43). The chained prisoners were thus driven on foot over 1000 miles through the snow for two months in the middle of the Siberian winter, North from Irkutsk to the death camp No. 303 on the Lena River (p. 60).

At the time that glowing reports on conditions of life in Soviet Siberia were being published (1944-1946) in the U.S., the true facts about Kolyma were already available, particularly to the officials of the U.S. and the British governments. Former Polish POWs, survivors of the Kolyma labor camps left Russia late in the summer of 1942 to form the Free Polish Army. Sixty-two separate written accounts were prepared about the different Kolyma death camps (Anders, 1949, p. 71). Copies of these reports became immediately available both to the Western governments and the news media. Moreover, the information from former Polish POWs was fully corroborated by reports from other sources, such as Russian officials and sailors who defected to the West (see references in Dallin, 1947). Thus the authors of the misinformation of that time cannot claim ignorance of the facts as an excuse.

Conclusion

The *Encyclopedia Britannica,* which contains long entries on the German concentration camps of World War II does not even mention Dal'stroi. The entry under Kolyma merely describes Kolyma as a river, adding a brief comment that "the only significant economic activity is gold mining in its upper basin" (p. 943, vo. 6). Under the entry: *Magadan Oblast,* we learn that: "Economic development is almost wholly restricted to mining of gold, silver, tungsten and mercury..." (vol. 6, p. 666). Maybe the entry under: *Magadan port,* will give us some hint about the sinister history of the entire region? Let's see! *Magadan port:* "The city was founded in 1933 as the port and supply center for the Kolyma goldfields...There are a teacher-training institute and several research institutes in the city" (vol. 6, p. 666).

George Orwell predicted that in the "1984" of his fiction the victims of the Big Socialist Brother would be eradicated even from memory, to become true non-beings. Today, in the 1984 of the real world, this fate has actually befallen the 5-7 million Kolyma victims of Marxism. Due to the strict censorship

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practiced in the Soviet Union, some of which appears to spill over into the free West, these people have disappeared even from the dustbin of history.

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INDOCTRINATION IN EAST GERMANY
A Review of G.E. Edwards' *GDR Society and Social Institutions*

By Wesley G. Lawrence

When the armed forces of the Soviets rolled into East and Central Germany during the last months of World War II, they found a land in which the main cities and communication networks had already been flattened by mass Allied bombing, in which the people were already starving, and from whence all men and boys capable of carrying arms had already left to join the German services, many of these having already died on the Eastern Front.

Instructed by their own Soviet propaganda to literally pillage and rape, to deprive the German women of their "racial pride" as Ilya Ehrenburg, the Soviet propagandist, urged, hell suddenly descended upon the civilian German women, children and elderly in the form of the Soviet military, recruited from all corners of Soviet Eurasia. Mass expulsions, accompanied by wholesale pillage and repeated rape, were the order for the women and children native to the eastern part of Germany, which was subsequently handed over to Poland, to compensate Poland for the loss of its own eastern provinces which were in turn forcibly incorporated into the Soviet Union. The civilians living in Central Germany, today known as "East Germany", or the German Democratic Republic, received the same brutal treatment as those expelled from the East German territories, except that they now became prisoners in their own homeland.

For several years the survivors were deliberately kept short of food and all necessities of life. In Berlin, out of a total of one and a half million dwellings, only just over one third of a million remained habitable at the close of the war, many of these being in scarcely usable condition. The currency was worthless, as the Soviets deliberately inflated the occupation currency with which they 'paid' for the goods they requisitioned, making their 'purchases' (in the years following the period of outright looting) virtually costless to themselves. Children were literally without shoes, and the production rate of shirts was only sufficient to provide each German with a new shirt once every eight years. Even when Marshall Aid was introduced into that part of Germany occupied by the Allies, the Germans of the

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Soviet occupied zone were denied that aid. In the absence of their menfolk, who were either dead or engaged in forced labor in Siberian prisoner of war camps, the women toiled to remove the rubble of their destroyed cities, long living in fear of the Soviet soldiers who had brutalized them so extensively.

Touching briefly on those earlier years, author Edwards summarizes the conditions as follows:

"In the first few years after the war it was women who carried much of the burden of reconstruction. As Erich Honeker, the Party leader, emphasised in 1971, the so-called *Trümmerfrauen* ('the women of the ruins') gave up millions of hours of their time to clear the rubble – often by hand – clean the bricks from the ruins so that they could be re-utilised, rebuild the factories and begin to establish order again in the countryside. Their menfolk had been killed in the war (The ratio of women to men in 1939 was 104: 100 but by 1945 it had become 135: 100, by then 57.5 per cent of the population was female and only 42.5 per cent male) or were sick or wounded or were in prisoner-of-war camps. For a time women made up 60 per cent of the workforce and were in many cases the sole earner for the whole family. Most women had to cope with the material difficulties of bringing up children in a war-devastated country where there was little food, lack of heating and lighting and there were frequent epidemics and illnesses and intolerable living conditions in the ruins of the cities, towns and villages."

As the years passed, the labor of the womenfolk was not to be allowed to be lost to the new socialist state. Like all socialist societies, the GDP prides itself on providing full employment for all, and ensures conditions where all must accept that employment in order to survive, even when they are mothers with young children. There is a hidden advantage in this for the Communist state, which not only needs their labor, but also desires to be secure in the allegiance of the youth. If the women are working, then they must put their children into state-run nursery schools for long hours, from a very early and impressionable age, and here they will become subject to state indoctrination before they are even old enough to attend regular school.

Socialist theoreticians have for long realized that the outlook of children is heavily influenced by their experiences during the first few years of their life. Children who are brought up in the

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security, the loving environment and the freedom of a family environment are unlikely to become readily subservient to the dictates of the socialist state machine. But if "socialized" under state direction from the pre-nursery period, and from that early age onwards constantly subjected to carefully planned mind and thought training programs by professional state tutors, they will be more likely to grow up into suitably pliable members of the proletariat, knowing no other possibility than that of a placid obedience.

Early after the seizure of Central and Eastern Germany, the Soviets began to propagandize the youth. The youth educated under the National Socialist government had learned dedication to the national ideal, and were initially strongly opposed to the attitudes of international socialism. However, the humiliation and defeat of their fathers, many of whom were never to return from the battlefields or from the Siberian prison camps – not to mention the more personal humiliation to which their mothers had been subjected – and the destruction of everything they had been taught to cherish, including the historic German cities which had been treasure houses of the national culture, created strong feelings of confusion and uncertainty which Marxist political re-educators were not slow to exploit.

The task of Marxist indoctrination was possibly made more easy by the fact that so many of the more patriotically enthused of the German youth had eagerly sought to defend their homeland, and armed only with rifles had been slaughtered with ease by the sophisticated weaponry of the Soviet divisions, equipped with state of the art technology. Absolutely defenceless against the Soviet occupying forces, and deprived of an older generation of German males to serve as role models, the surviving youth of Soviet occupied Germany suffered severe psychological trauma:

"Physically and socially young Germans in 1945 were confronted by many problems. It is estimated that one in three of them suffered from neuroses in 1945. 70 per cent were undernourished ... In 1946, 80 per cent of the prostitutes in Greater Berlin were aged between 16 and 18. . ."

The Role of the State Youth Movement

This situation provided an opportunity for those who now sought to win control over the minds of the German youth.

"On 31 July 1945 the Soviet Military Administration allowed

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the creation of anti-fascist, democratic youth committees in their zone and these quickly began to bring together youngsters from all backgrounds and political and religious persuasions to begin the task of re-educating their peers and organising practical activities among them....The emphasis was on anti-fascism, the demilitarisation of every part of Germany, the creation of a new democracy in a united Germany, education for internationalism and work to increase productivity."

These youth organizations put the youth to work for the state on labor-intensive projects. Between 1958 and 1962 it was calculated that one youth organization of only 41,000 members exploited its young members to the value of 52 million marks. Not that work was in itself injurious to the well-being of the youth, but free labor for the state was interwoven with lengthy re-education and indoctrination sessions. Author Edwards explains:

"The legal basis for the activities of the Free German Youth and for State youth policies is laid down in the Youth Code. There have, in fact, been three versions of the Code. The first became law in 1950, a revised version came into being in 1968 and the present Code was passed by the People's Chamber in January 1974 ..."

"The Code...is founded on the premise that the basic aims and interests of society, State and youth are one. It is the right and duty of the youth to help in developing a socialist society, to defend it and to work with the Soviet Union for the benefit of the socialist countries. The Code guarantees the "right of the young" to take on responsibilities and play a full role in the life of society and states that the development of young people into socialists is basic to the policies of the State and its organs ... The Free German Youth has a central position throughout the Code and this indicates just how important the movement is within the government's youth policy."

The overall responsibility for indoctrination, beginning in the classrooms but permeating also the hours of leisure and recreation, is centralized on the Free German Youth organization, which also organizes mass rallies "for peace" which make the West appear to be the aggressor.

"Political education takes place in schools and colleges, at the place of work and indirectly during leisure time through participation in voluntary work and the activities of the FDJ.

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Political Indoctrination in Schools

"It is a feature of East German school courses that they spread across academic disciplines and interlock them. An obvious example of this is political education. Teenagers have already been introduced to politics and the life of society further down the school but from the age of 14 onwards this process becomes more important and more formalised. This fits in with the call made by the SED at its Eighth Congress that education should unite a scientific approach with a clear political position. The new curricula which were introduced in 1974 meant that 'ideological education' was a part of every course and that, wherever possible, theory was taught in its practical context."

"The most obvious areas of political education are to be found in the subjects: history, civics (*Staatsbürgerkunde*) and geography. In history, 14-year olds have already covered primitive and slave societies (fifth class, thirty periods), the break-up of the Roman Empire, feudalism, the Renaissance and the Reformation (sixth class, sixty-four periods) and the beginnings of capitalism, the French Revolution and industrialisation (seventh class, sixty-four periods). In the eighth class they study the beginnings of the working-class movement, the Communist Manifesto, the 1848 revolution, the unification of Germany, the beginnings of imperialism and the First World War (sixty periods). A similar amount of time is spent on the Russian revolution, the development of the Soviet system, the history of the Weimar Republic and fascism in Germany (ninth class). The tenth class concerns itself with the post-1945 development of the GDR and the socialist bloc and with decolonisation in the developing countries (56 periods). For those who go on to take the *Abitur*, history as a subject is completed in the eleventh class and takes up ninety periods. This course repeats, with a more international slant, the period 1970 to the present.

"History teaching dovetails into civics courses which start in the seventh class. Thirty periods are taken up that year with the transition from capitalism to socialism in Germany, the problems of rebuilding the GDR after the war and the differences between the GDR and the Federal Republic. The eighth class examines the constitution of the country, structure of government, basics of foreign policy and the current political situation (thirty periods). Basic ideological concepts – capitalism,

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socialism, imperialism, communism are defined and examined by the 15-year olds (thirty hours), whilst the 16-year olds concentrate on revolutionary developments in the world, the economy of the GDR, questions of socialist morality and attitudes to life (fifty-five periods). For those who are going to university or college and are taking the *Abitur* the eleventh and twelfth classes provide an introduction to Marxist-Leninist philosophy, to the theory of class and class struggle, socialist-revolution and the nature of the State (thirty and fifty-four periods, respectively).

"...Language acquisition is linked with the imparting of information about the political, social, economic and cultural background of the countries concerned....Russian is the first foreign language and is compulsory for all children from the fifth class onwards and at colleges and universities. The children learn about the life and leisure activities of their counterparts in the Soviet pioneer and Komsomol movements, about Moscow and Leningrad, work in a Soviet factory, the life of someone who took part in the Russian revolution, heroism among young Soviet citizens in the Second World War, the opening up of Siberia and co-operation between FDJ and Komosomol.... English is the most important second foreign language and courses begin in the seventh class. The school textbooks issued in the early seventies and the series *English for You* give an idea of the picture of the United States and Britain which East German children gain...There are also descriptions of poverty, bad living conditions, racial discrimination and injustice...Much attention is paid to demonstrations, strikes and lock-outs, the struggle of blacks for equality and the role of the Communist party...The teaching of literature, both German and foreign ... literature, includes the study of revolutionary and left-wing works...Education for peace involves studying the reasons for war (classes eight and nine), activities aimed at world peace (classes one to four; history course, class ten and civics course, class seven), the work of the GDR for peace (civics, class ten), the question of disarmament and the risk of nuclear war. The threat to peace is, naturally, perceived and interpreted as coming from the West."

The socialist concept of society aims even at breaking down the traditional German respect for women, and the traditional division of labor between the sexes.

"At crèche level girls and boys have equal access to dolls, soft

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animals, trains and other models. Boys are actively encouraged to play with dolls and girls with models and moving objects. This is done to counteract the strong tendency for parents to buy toys along traditional lines according to the sex of the child...Nowadays at the crèche the attention of the parents is drawn to the need to give both sexes broad access to toys, as is the case during the day in the crèche."

Apparently the old German love of family has survived this indoctrination campaign, and what was left of the older generation has sought to make life easier for these youngsters by not opposing Marxist indoctrination – having seen, in the massacres and mass arrests that followed the one national uprising attempted by East Germany in the 1950s, that it was futile to oppose the Soviet military and the Marxist secret police.

More recently, on the bright side, the youth have been encouraged to take an interest in what remains of their war ravaged country, in which the major cities that had been treasure houses of history and of German cultural tradition were obliterated and replaced by colorless socialist-style concrete structures, and the beauty of the unspoiled countryside has exercised a favorable and healthy influence on rambling groups. There are moments when children discover ideas for themselves, simply by the inspiration of contact with historic things, buildings and places, and doubtless there are older Germans 'in the system' who seek to preserve the values which they themselves cherished.

"A very strong trend which is developing at present is for young East Germans to discover their own country through rambling and camping. For example, in 1979 more than 650,000 girls and boys took part in the FDJ tourist movement 'My homeland, GDR'. This fits in with the overall re-discovery of the past of this part of Germany in previous centuries. The statue of Frederick the Great of Prussia has been re-erected in Berlin, there was a highly popular exhibition on the great Prussian architect Schinkel in 1981, the Luther and Goethe anniversaries have been celebrated with many exhibitions and events and there is emphasis on local history and local traditions. The enjoyment of the coast and the countryside and the efforts of the FDJ to get more people out and about fit into this pattern. Slowly but surely a GDR patriotism and the realisation that the country is beautiful and has much to offer is developing, particularly among the young."

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However, the persistance of elements of German patriotism, resulting from the experience of contact with the past as represented by the rural heritage, is actively counter-balanced by state organized tours and excursions designed to promote international contacts with the youth of other Soviet controlled lands, and by measures to promote social and political contact with youth from the racially different continents of Asia and Africa.

Although the Marxist government has repealed all laws against homosexuality, its incidence is not high, and many old German virtues survive in personal relations. Nevertheless. pre-marital sex has become widespread, being encouraged by government policies which have made contraceptives easily available, with the effect, also, of lowering the birthrate. The rock and roll culture of the West has gained a dominant position amongst the young, but at least the emphasis that the GDR has placed upon competitive athletics and the success that its athletes have achieved internationally, has promoted a healthy interest in sport, and with sport, the commitment to fair play has survived. Such crimes as occur among the youth are most frequently attributable to alcohol.

Indeed, in light of the state-controlled program of constant indoctrination, denying the individual the ability to gain true impressions of history or of dreams of life which are alien to the socialist vision, it is remarkable how many of the old German virtues have survived. Readers may be surprised by the concluding chapter of the author's detailed study:

"...To anyone who has made a study of German history and culture, it is evident that the GDR remains German and has both the strengths and weaknesses of its national culture and traditions. Many of the values propagated in the GDR have their antecedents in previous centuries in Germany – the virtues of working hard, exercising self-discipline, being honest, upright and incorruptible, of being thrifty and saving for a 'rainy day', of wanting to learn and of helping others who are in need... The rediscovery of the love of nature, hiking and camping are reminiscent of German romanticism or the *Wandervögel* prior to the First World War. Many of the villages and small towns have remained unchanged over the centuries and have not fallen to post 1945 developers or the consumer society, as has been the case in the West."

To counter the tendency for young Germans to feel them-

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selves to be German for so long as they are able to retain their own language – something which is being denied many smaller minorities under Soviet control – every attempt is being made to emphasise only the leftist tradition in German history, and to show the GDR as the logical 'flowering' of liberal traditions. To the extent that the state is in a position to deny access to any knowledge that it wishes to suppress, the state is presumed to be capable of modifying behavior patterns – unless, of course, the evidence of recent genetic research proves to be valid, and human behavior patterns are found to depend more strictly on biological determinants than has hitherto been supposed. Unfortunately, for the youth of East Germany, and indeed, of other East European captive nations, constant Marxist indoctrination is reinforced by the glimpse that the young Germans gain of modern culture in the West, since the vision of drugs, crime and empty art forms such as punk rock merely serves to substantiate Marxist propaganda. Such glimpses of the more seamy side of Western post-World War II offer little that is noble or heart-inspiring to counterbalance the constant stream of socialist propaganda which engulfs the lives of East Germans from the cradle to the grave.

* *GDR Society and Social Institutions: Facts and Figures* by G.E. Edwards, St. Martin's Press, 175 Fifth Avenue, New York, New York 10010, Price: $27.50.

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THE UNIVERSITY AND ECONOMIC DEVELOPMENT: OPPORTUNITY AND CONCERN

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I. Introduction

Daniel Bell's forecast of the coming of the post industrial society(1) has been borne out with remarkable accuracy. The only criticism one might offer is on his timing: events have overtaken his prediction. As changes have occurred in the past, his missed timing would rate little comment. But it illustrates a point important to this paper: in our highly interconnected society, changes can take place so rapidly that the rate is difficult to predict – or to be believed if predicted. Further, the majority of sectors of society will need to respond to change rather than cause it, and the response time of those sectors may be so slow that significant dislocations will occur. Steel and automobiles are, perhaps, the most familiar examples, but sections of the computer industry are current victims of this phenomenon as well. The service industries, toward which employment has shifted – and is continuing to shift – are also changing rapidly, and sound economic development must look to that sector as well as to the high technology industries which attract the most attention. Finally, the so-called smokestack industries need to be kept competitive in order not to become the "sunset industries" some observers have labeled them. The global responsibilities of the United States require, it seems to me, that the U.S. maintain a balanced economy capable of supporting not only itself but also of providing leadership around the world. The U.S. cannot, therefore, abandon any significant sector of its economy to other countries. In the complex international system of which the U.S. is such an integral part, to achieve and maintain the appropriate balance is a very difficult project. Similarly, concern for the social impact of economic development increases as changes that we may once have had a few generations to absorb now require a response in a decade or even a few years.

It is my thesis that the university has a role – by no means an exclusive one – in all these aspects of economic development and societal accommodation. The university has always played a role in economic development, and its role in agricul-

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tural development has been institutionalized in the United States by the Morrill Act. Most state supported institutions have a variety of service organizations that contribute directly and indirectly to the state's economic development. Research done in universities is the basis for much technological advance. In addition to these, I am speaking of an extended participation in a range of aspects of economic development in which intercommunication among groups of researchers and university based policy analysts is encouraged and fostered for synergistic benefit. While some of my colleagues may advocate a role for the university in *resisting* technological change, I find no support in history for the effectiveness of such a position, without even raising a question about its validity. So long as the human race survives, it will refrain from applying knowledge (for good or bad) to the functioning of society. Thoughtful persons concerned with the maintenance of human values in the face of the increasing incidence of machines in daily life will play an important role in the societal modifications which must inevitably accompany economic development. Many such persons are in universities.

II. High-Technology Industries: Their Attraction and Support

A principal concern of some 20,000 localities in the United States is to attract the high technology industries which are characteristic of the information society we are developing. These industries are highly desirable members of the community: they are easy on the environment, pay high salaries and grow rapidly. They are relatively independent of the locations of natural resource supplies and do not require large transportation systems, so they are foot loose. They can locate almost anywhere, which is helpful if you are trying to attract them and worrying if you've got a few in your locality already. Typically they employ many more technically educated persons than the average manufacturing industry, spend more for Research and Development, are entrepreneurial and relatively small (75% of these firms have fewer than 500 employees).

These characteristics; i.e., knowledge based, dependent on R & D, high rate of employment of scientists and engineers, indicate the importance of a university for attracting and supporting a high technology industry. A staff paper(2) prepared for the Joint Economic Committee of Congress discusses the location of high technology firms, and details the many con-

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siderations which affect plant siting. Extensive studies included the complexes around Boston and Palo Alto, which, not coincidentally, have two of the major concentrations of universities in the country. My concern, of course, is with the university's role in attracting industry and mediating the social adjustments which may be attendant.

There are six attractions a university offers to industry, some of which are crucial to high technology firms. First, a comprehensive university (like a major technical institute) provides a steady supply of highly educated persons in technical and scientific fields. These graduates provide the labor pool from which the ranks of science and engineering employees will be drawn. Secondly, the university is the natural location for the basic research on which technological progress is founded, and the applied research on which development is based. An NSF study showed that between 1960 and 1973, 54% of the basic patents on which "technological breakthroughs" were based had been the results of university research.(3) The current climate of university/industry cooperation encourages staff exchanges and joint research projects – or even industry support for research programs to be carried out in universities. Thirdly, the university is a major source of the information on which the life of the company depends. Through its information resources, including but not limited to its book and journal collections, the university provides access to data bases few corporations could afford to duplicate. As a number of knowledge-intensive industries have learned, it is economical to purchase materials for university libraries in specialized areas, and let the library manage the information for them (and the rest of the university community). Knowledge-intensive industries may frequently have computing and information processing equipment superior to that available in universities, but the university resources may become an important adjunct. In many cases, however, the university's information processing resources form a major support for many small high technology firms. Fourthly, the infrastructure of small entrepreneurial industries that supply specialized research, components and technical services is fostered by the presence of a university. Faculty frequently start these firms or inspire them or contribute directly to their functioning. This activity is an important aspect of technology transfer; i.e., the transition of a discovery from the laboratory to the production of a useful device. University

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faculty may contribute to technology transfer also by assessing the technical feasibility of new ideas and marketability of the product that is proposed to be offered. Fifthly, as an educational institution, the university offers educational opportunity to industry employees, whose promotion opportunities and value to the company will depend on obtaining advanced technical degrees or maintaining technical currency through continuing formal study. As important, the children of the industry employees, who attend postsecondary institutions at a much higher rate than average, have a place close to home in which to enroll. The university will have an increasing role in working with the primary and secondary schools in its area, as the demand for computer and scientific literacy, analytical reasoning and sound communication skills are recognized and strategies for responding are developed. And sixth, the university is a cultural center, offering and attracting cultural activities which are especially important to the employees of these industries.

It is, of course, the university as a research center, that is most attractive to knowledge-intensive industry. No such industry can survive, much less develop, without access to current research. A Brookings Institute study(4) showed that 50% of the national economic growth between 1948 and 1969 was attributable to R & D, and the figure is higher for the last 15 years. In the United States, 70% of the country's research is done in universities. A dramatic recent example of the importance high technology industry attaches to the presence of a strong research university is the siting of the Microelectronics and Computer Technology Corporation at Austin, Texas.(5) The ability of the University of Texas to commit itself to *growth* in the appropriate areas (electrical engineering and computer science) was the key to the final choice of Austin over other contenders.

III. Research Corridors and Research Parks

To make the university/industry interface more convenient and productive, the university-associated research park has been developed. Stanford led the way with the Stanford Research Institute, and currently there are research parks associated with Purdue, Princeton, Utah, Georgia Institute of Technology and Cornell. Among other functions, these parks provide small companies with facilities to set up research projects that they could not afford to house independently. Research space is

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expensive to build and equip with special requirements for vibrative isolation, environmental control, standarized measuring instruments, and precisely controlled power. Obviously the opportunity to associate with other research personnel and to engage the services of graduate students and faculty consultants are important factors in the success of the small firm engaged in technical innovation. For first-time entrepreneurs, the university's assistance in developing a marketing plan and business management plan may be essential. Even the larger firms do not cover in house all the varieties of R & D they must undertake to keep abreast of competition. Research parks are, therefore, of value to them as well, and the presence of one on a university campus is a strong attraction to locating nearby.

The importance to the economic development of the country of forming new small companies has received considerable attention. Shapiro reports(6) that young electronics firms have 20 to 40 times the job growth of older firms, and the growth rates of still younger firms (up to ten years old) are 50 to 100 times the rates of older firms. Obviously their base is small, but the point is that economic self renewal requires such new blood to be strong. Older and larger companies have recognized this need by starting independent new firms with capital from the parent organization. Innovation and risk-taking, essential to economic health, are characteristics of new small businesses rather than older well-established industries. As demonstrated universities can play a strong role in facilitating the circumstances which favor industries.

The ability of the University to assist effectively in the economic development of a state, region or the country is dependent on available resources, which are supplied in many cases by governments at every level. The Federal role in research support has been significant since the Second World War. The states have been slow to become involved in that area (although there has been some support for development and applied research with a short payoff potential), but have increasingly been active in a number of ways more recently. The Research Triangle in North Carolina is a pioneer example of a cooperative arrangement between the state and university (three of them in this case) to support economic development in the high technology arena. Realizing that with such businesses more was needed than land availability, a work force, and a favorable tax climate (although these are essential, too), the state built a

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research facility and funded the universities to allow faculty to work alongside a permanent staff on appropriate research projects. High technology industry was invited in to contract for applied research or to support basic research in selected fields.

Although highly successful during wartime conditions, an alliance of the university, business and government to promote economic development in peacetime is relatively recent(7) but is receiving considerable attention.(8) The different value systems of these three elements of society require an accommodation that has not always been viewed as comfortable.(9) The current concern for the relative decline of the United States in technical innovation has inspired the effort to bring these elements together, and the results have, perhaps, pleasantly surprised all parties. The possibility of the support program getting caught in the crossfires of politics is perhaps the least comfortable feature of the association.

One important result of the alliance has been the formation of research corridors, where the universities and businesses already inhabiting a region associate for mutual assistance and to provide the attractions for new industry along the corridor. State government support, principally to allow the universities to increase their strength (in research and educational programs at the graduate level) in selected areas, is the basis for the corridor formation. New Mexico's Rio Grande Research Corridor, which includes four major government laboratories, a number of branch plants of high technology industries, several institutions offering postsecondary technical training, is a new venture which has already attracted some attention. Tennessee is planning a Technology Corridor to include another national laboratory (Oak Ridge).(10)

When one is building on a small base in competition with others, one values such advantages. Information networking, to make available the public data bases of all institutions participating in corridor activities, is one such advantage. A fiber optic network to span the Rio Grande Research Corridor is being developed in New Mexico by Mountain Bell, with each participating institution developing its own local area network to be connected to the trunk. When completed, each work station will be able to access all the others. This will prove a tremendous advantage to a new company coming into the corridor and being able to access the extensive information

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available on the network. Eventual hookups to national networks will increase the range of information available. Electronic mail, conferences, the sharing of seminars and delivery of education will also be accommodated by the network. Thus, for example, special courses can be delivered on site to an industry from any one of the universities, or from more than one if expert background is distributed. A private not-for-profit corporation (Technet) has been formed to facilitate the university/laboratory/industry cooperative use of the network.

A further advantage which a state or region can gain in economic development is by involving university experts in planning the effort. The range of items considered by industry in relocating(12) requires comprehensive response. Studies of the state's laws, regulatory policies, natural and human resources carried out with the aid of university faculty and graduate students can provide a major portion of an effective response. Such a study, conducted, for example, by a commission including private sector industrial representatives as well as government and university persons can also recommend changes in tax and regulatory policies. These policies are frequently formulated to realize a specific purpose, without regard to their impact on other sectors of society.(11) A comprehensive study can attempt to balance the needs of various societal sectors and optimize the benefits to all of them. This requires the kind of careful and objective analysis and development of alternatives that can be considerably aided by university faculty accustomed to working in this mode.

An aggressive development policy should seek to find corporations that can be persuaded to locate in a given state. This effort can be supported by a careful and broad based study of the corporate characteristics to find a match with the local advantages provided especially by the programs of the university — and the strengths of these programs should be carefully compared to the needs of possible target corporations. When a match is found, the target is identified and the campaign can be focussed with the greatest likelihood of success. The university will clearly have a major role in this type of study, and given the probability that senior officials of the target high technology companies will be technically trained, appropriate university personnel should be included in the development team assigned to approach the target industry.

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IV. Strategic Planning

Strategic economic planning can occur at several levels: a national government can coordinate the planning and development for all the industries of the country, a comprehensive plan for a sector of industry (steel, electronics) can be made, or an individual corporation or division of a major corporation may develop a plan for its development. The primary characteristics of strategic planning are the comprehensiveness of its information base, the identification (with, of course, some uncertainty) of trends that will persist into the future, the selection of long range goals, and the design of flexible methods of moving towards those goals. The criticism that American management has fallen collectively (with significant exceptions) into a mode of very short range planning(12) perhaps makes this fairly obvious description relevant.

At least two of our allies, Japan and France, have developed strategic plans at the national level.(13) For Japan, focus is on microelectronics, computers, new materials, robotics, telecommunications, aerospace and biotechnology,(14) but it has not neglected its basic steel and automobile industries in its planning.(15) The United States has traditionally put its faith in the private sector rather than in national planning, and there is no likelihood that this will, or should, change. Attempts at national planning for an industry sector, such as synthetic fuels, provide examples of the failure of this approach in the U.S. This does not mean that the national government has no role in the development of advanced technology in the U.S., and in fact there is considerable need for a comprehensive data on national and international laws, regulatory policies and practices that affect technological development.(12) I believe that the supply of comprehensive data on such subjects could lead to a strategic plan for the development of each sector of our industrial complex. This could be presented in terms of options and projections while recognizing that the primary action will remain in the private sector — most likely within individual corporations — to select its future voluntarily from among the options.

The issue of a national industrial policy continues to be hotly debated.(16) It has already been pointed out that other countries *are* developing national policies and any study of the developing economic scene(17) extends these remarks. The

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United States has not developed policies with a similar intent because of its tradition of individualism and private enterprise. It sees its strength in the response of many persons to opportunities they discover and can pursue without central control. But I wish to distinguish between the establishment of government-directed policies and the provision of research and accumulation of data useful to help the private entrepreneur to make their own informed decisions. I believe that task groups of industry, government, and university experts can usefully address the current status, future prospects and the means to reach a chosen future from the existing present for each sector of industry. In fact, this is already under way, at least in part,(18) and hence may only need extending. The question of how the goals are to be achieved then arises. In our society, participation by industry must be voluntary, but a well researched set of coordinated goals will attract the attention of the most forward looking managers as a matter of enlightened self-interest. There are examples of industry-wide efforts to support research for the common good (EPRI, the Steel Institute, and, most recently, the Microelectronics and Computer Technology Corporation), and these should be encouraged. University faculties have a role in this process as consultants, researchers and teachers.(19)

Of particular concern is strategic planning in high technology industries. The rapid changes in technology have made many companies the "victims of technology rather than its masters."(20) International competition makes such a situation especially problematic for American industry.(12) Richard Foster(21) has pointed out that technologies follow a rising "S" curve as they develop. This is an example of the "logistic" or "biological growth" curve familiar to workers in a number of academic fields. Simply stated, as a new technology developes, it is rapidly adopted, producing exponentially increasing sales or production. As the market becomes saturated, however, the demand will level and may eventually drop. Anticipating this stage, the planner should have selected the next rising technology and should prepare to make the shift to it. This requires that the research necessary to facilitate strategic planning should be in hand: one needs to have sufficient information to select the new technology and to decide when to jump. There will be a *drop* in corporate sales at the discontinuity, because the new technology will be in the early stages of its rise. Hence

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the long range is emphasized at the expense of short range returns. If this is not done, "competitive leadership in a market generally changes hands."(20) Foster notes that none of the top ten vacuum tube manufacturers successfully made the transition to semiconductors. But in Japan, between 1950 and 1982, electronic industry emphasis changed from radios to black and white TVs to color TVs to high quality audio equipment to Video Tape Recorders – with each new product phased in so that the total production of declining and rising items resulted in net rising sales.(15) No better example of the value of strategic planning need be offered.

Should a state decide to facilitate strategic planning in a particular sector, university faculty can join representatives of government and private industry in researching data. New Mexico has decided to plan in the energy sector, and has created the New Mexico Energy Research and Development Institute to assist the Energy Mineral and Economic Development and Tourism departments of state government in both planning and implementation in the energy area. Research, development, pilot demonstration, market analysis and distribution studies can all be supported with state funds. The availability of small amounts of state funding to assist industry in various ways to get started or to grow is an obvious incentive – which works not only with the small firms for which the support may be vital, but also is attractive to large corporations as they assess the societal climate in a region. A strategic plan, revised each year to respond to experience and changes in opportunities, guides the support of entrepreneurs. Technical advisors are drawn from the universities and private sector.

V. Automation and Integration of Control

Strategic planning must be applied to the methods of manufacture of a given product or line of products as well as to the development of new products. The application of technology in manufacturing is an important area of concern. The key jargon includes Computer Aided Design/Computer Aided Manufacturing (CAD/CAM), Computer Integrated Manufacturing (CIM) and Flexible Manufacturing Systems (FMS, sometimes called FFS for Flexible Fabricating Systems), which may be the outcome of CIM involving CAD/CAM!

Aerospace has led the way,(23) but other industries are in the process of automating with the aid of computers.(24)

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Wherever the work is dangerous, physically demanding and/or repetitive, there is an obvious place for a robot (the anthropomorphic science fiction robots are misleading). In a CIM system, automated segments of the process, including inventory control, parts delivery at the right time and place, movement of the unfinished product to the next stage of manufacture, and inspection of the result for quality assurance are all controlled by special purpose computers. General purpose computers are part of the system in the CAD stage, and, finally, the business functions of the corporation are both automated and integrated into the whole system. Automated processing has been the heart of the petrochemical industry for years, and the lessons learned and taught by chemical engineers are available for application to CIM. The Japanese, with typical aggressive foresight, are concentrating significantly on robotics.

It is especially important that the so-called "low tech" or "smokestack" industries develop CIM systems. Machine tool, automobile and steel manufacture are among the basic industries which, in my view, must not be abandoned to other countries and treated as "sunset" industiries, but should instead be automated in order to remain or again become competitive. Not only are these basic industries so large a part (much larger than high technology industries now are) of the economic mix that to replace them by imports staggers the imagination,(25) the role of the United States in world affairs requires a balance in its productive sectors. These industries should depend on the government for relief from international dumping, but on automation rather than protectionism for maintenance of market. A recent NSF study has developed the alternatives available to steel.(26)

The complexity of CIM requires research for its optimum design and implementation. For example, the best arrangement of computers to control the system presents a topological problem of long standing – which we now have a handle on.(27) The research role of the university should provide an important support for the effort. As in the case of strategic planning, research and instruction in CIM will be broadly multidisciplinary – and will require an integrative approach not always comfortable to members of academia. The striking accomplishments of the Princeton group under Hazony(28) in this field show what can be done. Industry and other universities will need to take a hard look at this work.

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VI. The Social Consequences

Technological unemployment would seem to be one consequence of the wide-spread use of CIM. Indeed, the increased productivity required in the basic steel industry to remain competitive is obtained by replacing people by machines. In Japan, the system takes care of this: people are retrained, reassigned – and retained. There is little labor opposition to automation.(15) In the Aerospace industry in the U.S. the same attitude seems to prevail.(23) Retraining and reassignment have been the keys, and workers formally accustomed to a single task enjoy a better quality of work life when they are part of a manufacturing team with multiple responsibilities. The use of emerging educational technologies, developed with the aid of university research, can reduce the economic burden of retraining.

But these positive responses cannot be used to dismiss the problem. The paternalistic Japanese system is unlikely to be widely adopted here. In some industries, significant reduction in force may occur. At minimum, displacement, both technological and geographic, is likely to be an important consequence of automation. It is a function of society to deal with this problem. We cannot afford massive unemployment for any reason. The problem is not new – technological unemployment, or displacement has occurred before. But we cannot learn much from earlier experience because of the rate at which change may take place now – much more rapidly than before. So long as the economy is strong, the end result is clear: people change jobs, finding employment in other industries – service industries, for example. But there are a number of subsidiary problems which require considerable study. Here I believe the university again has a role – along with government and industry. Current unemployment in Michigan, for example (which is economic, not technological) has produced displacements that are difficult to deal with, and not yet satisfactorily handled. With a greater societal complexity and potentially a larger displaced population, it is not clear that, without help, the absorption of dust bowl victims which occurred in the 1930s, for example, can occur again. But I believe the consequences can at least be ameliorated if research and planning take place. Industries like steel should take the lead with labor in defining the problem, to be joined by the universities and government in finding and implementing solutions. An intriguing possibility

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for a manufacturing industry employing the products of the information industry to increase production is to plan and launch small firms which can absorb retrained personnel and provide employment growth. Diversification is not only sound economically in this mode, but socially positive as well.

But this is not the only or even the biggest problem with our evolving society. Whether basic industry will only decline in its share of the economy while growing in absolute terms, as I believe it should, or fade into the "sunset" as some high technology enthusiasts propose, there is no question that the proportion of people in service industries and in information processing will increase. This is what Bell meant by the post-industrial society: not that traditional industries would disappear (agricultural production is, of course, much greater than it was when over half the population engaged in it), but that the service sector would dominate employment.

Service sector jobs, as they are now constituted, are relatively low paying. In some cases they are part time, or their holders move from job to job without establishing a work place identity.(29) There is a developing polarization of job opportunities between those requiring high levels of education and those requiring only basic skills – and the latter are an increasing fraction of the whole.(30) Japan is already experiencing the problems of a two-tiered society.(31)

I have no new solution to offer, but I believe the problem is susceptible to analysis and that solutions can be found. It is not too early for the universities to begin doing their part in that analysis.

VII. New Responsibilities and the Maintenance of Traditional Values in the University

The economic development of this, or any other, country in the information age demands an educated populace. Skills beyond the minimum in reading with understanding, writing with clarity and reasoning from data are essential. Several reports in the last few years have pointed to the failure of our educational systems to ensure that those essential skills are possessed by all our people.(32) Mathematical, scientific and computer literacy are needed at all levels, from general acquaintance to expert knowledge. Universities that educate the teachers have a responsibility to provide updating for in-service, as well as new curricula for pre-service teachers. The develop-

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ment of educational technologies that will be an important (but not only) element in remedying the deficiencies in the schools is a shared responsibility of the universities, the schools, the government and a variety of industries.(33) Universities will be called upon also to use those technologies not only for programs delivered in house, but to reach industrial audiences on site. Research opportunities in the development of expert educational software will be presented, and the universities must be ready to assemble the groups that can respond.

The management of information has become so important that administrative initiatives must be taken to ensure that the university optimally serves its students and faculty as well as constituents in industry and the professions outside the institution. A study done for the U.S. Department of Energy estimates that $13 billion annually is saved by the proper management of information in the energy field alone.

Educational program opportunities in information management must be provided students and in other developing fields indicated above where information control is a hallmark.

The need for increased foreign trade if U.S. industries are to remain healthy has been pointed out in a number of studies — one of recent date was carried out by the National Academy of Engineering.(35) The university has an important role in educating persons to serve in the international trade divisions of American industry. Successful penetration of foreign markets requires that the economic climate, political structure, cultural background and legal complexity of the target country be well understood. Communication and transportation make world markets accessible to any industry of any state, but the market is not of one piece. Understanding the needs and potential of other countries calls for a complex body of knowledge which universities can supply. Programs in international management, integrated with appropriate language, cultural and legal studies need to be developed and offered by universities in considerably greater numbers than in the past if the U.S. is to readress its current imbalance in international trade.

The research capabilities of universities are being called upon to provide direct assistance to industry. In New Mexico, the legislature has funded five centers of excellence at three institutions to extend university research capacity in areas attractive to industry and in support of the Rio Grande Research Corridor already mentioned. Government laboratories and local industry

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are offering joint appointments between themselves and the universities for technical personnel. With these welcome opportunities come natural concerns for the maintenance of traditional values of the university. In particular, corporate and government laboratory partnerships raise questions about intellectual property and openness of communication of research results for university participants. Bremer(36) has remarked that universities must not be considered merely "a readily available and convenient source of brain power...a mere extension of the development arm of industry...." But, as he also says, "If a university/industry research arrangement is to succeed, the parties must first recognize that their respective roles are different and that, therefore, the peculiar needs of each must be respected" – a point I have made before.(37)

The question of intellectual property in government partnerships has been resolved (the university retains the patents) for research supported by Federal funds, and the universities acquire the responsibility then for technology transfer. But intellectual property rights lead quickly to withholding research from publication – at least until patents are issued. While this is at least questionable by traditional university standards concern may be even stronger that the traditional university emphasis on basic research may be compromized by efforts to undertake potentially marketable projects. The spring 1985 issue of *Science, Technology and Human Values* is concerned with this question, and is recommended to those with this concern.

More troublesome would be questions of research that might be in a classified area – or, as has happened recently – might become classified after the fact. Some of the research in support of the Strategic Defense Initiative will be done in universities, but so much of it will be basic and benefit to the non-military economy,(38) that classified projects need not be undertaken. Nevertheless, caution must be exercized to see that the principle of openness in university science not be violated – or that there is clear and compelling justification for doing so.

VIII Conclusion

I have outlined an ambitious and far reaching role for the university in economic development. It is a role that calls for more speculative analysis than scholars are accustomed to. It calls for an extension of the partnership with government and

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industry (of which labor is an important part) that has served us well in war and is being revived in current stressful times. While we aid the advance of technology, we must at the same time maintain the traditional human values essential to the quality of life. While embracing a new role, the universities must maintain the essential elements of intellectual balance and independence which have made them a constant force in the world for 800 years. We must learn to cope with changes of such rapidity that new social and personal survival techniques have to be devized. I have no doubt that we have the capacity, but am not sure we have the will.

FOOTNOTES

(1) Bell, Daniel, *The Coming of the Post Industrial Society* Basic Books, N.Y., 1973.

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(3) Peng, Charles, *Harvard Business Review*, September/October 1981.

(4) "Meeting Technology and Manpower Needs Through the Industry/University Interface," Aerospace Industries Association, Inc., May 1983.

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(6) Shapiro, Albert, "Developing a High Tech Complex Through Small Company Formations," *Business Review*, University of Tenneessee, Summer 1982.

(7) Hull, M.H., "A Leadership Troika in Technological Progress: The Role of the University in Partnership with Government and Industry," address to the NASA Symposium, Albuquerque, March 15, 1979; *Albuquerque Journal*, "UNM Provost Urges Teamwork on Research," May 26, 1980; "Prospects for Growth of High Technology Industry in New Mexico," testimony prepared for Senator Harrison Schmitt, Senate Subcommittee on Science and Technology, February 9, 1981; "Moving Technology Into the Market Place: A University View," address for the Showcase for Technology, Albuquerque Convention Center, October 30, 1981.

(8) WICHE Reports, Vol. 26, #3, Autumn 1981: Industry, Government and Higher Education: Partners in Economic Development, is one of may discussions of the matter.

(9) Report of the University-Industry Relations project, University of California, 1982; Hull, M.H., "Moving Technology Into the Market Place: A University View," op. cit.

(10) Alexander, L., Parish, J., and Haslam J., "The Technology Corridor," *Survey of Business*, University of Tennessee, Summer 1982.

(11) Jordan, Jerry L., "The Problem of Productivity in Restoring Prosperity," 1983 Frank M. Engle Lecture of the American College, Bryn Mawr, Pennsylvania, discusses, for example, the impact of environmental protection and worker safety policies on productivity measures. He does not argue for the elimination of these policies but on the appropriate method of paying for them. In a major policy paper, the Panel on Advanced Technology Competition lists a wide range of national and international policies which affect economic development in Advanced Technology (National Academy Press, 1983).

(12) National Research Council, "International Competition in Advanced Technology Decisions for America," National Academy Press, Washington, D.C., 1983, cited in footnote 11, is one of many analyses making this point.

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(13) National Research Council, op. cit. Japan shares its plans quite freely: Abeggelen, J.C. and Etori, A., "Japanese Technology Today," Advertisement in *Scientific American,* November 1983, p. 54 ff.; and Long Term Credit Bank of Japan "Japan's High Technology Industries," May 1983.

(14) Long Term Credit Bank of Japan, op. cit.

(15) Abeggelen and Ttori, loc. cit.

(16) Modic, S.J., *Industry Week,* November 14, 1983, p. 38 reports one example of the debate.

(17) Rubin, M.C. *Information Economics and Policy in the U.S.,* Libraries Unlimited, Inc., Littleton, Colorado 1983, p. 319.

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BOOK REVIEWS

MODERN CHINA: The Mirage of Modernity
I.W. Mabbett
St. Martin's Press, New York, 1985

Most writing on modern China dwells on those aspects which are new to China since the Communist takeover, stressing above all politics, Marxism, economic and agricultural development. This book argues that all this writing creates a false impression of what present-day China is really like.

Modern China: The Mirage of Modernity contends that much of traditional China remains, particularly at the grass-roots level, and that Buddhism and the Buddhist tradition continue to exert an influence. Politics in communist China is best understood in the context of this tradition. Throughout arguments are supported by revealing how tradition continues in the economy, in society and the family; by examining in detail the Buddhist tradition; and by using the case study of education to show the interplay between modern and customary forces.

Thus the author points out:

> What happened to Chinese society was only partly that the weak rose up and overturned the throne of the strong. It was partly that an attempt was made to freeze village politics at a particular point, to draw a line around those parties considered potential friends of the regime and another around those considered potentially hostile, and to make a regular aristocracy out of the first, regular outcastes of the second...

The officials of Communist China, although drawn from a new elite comprised primarily of persons recruited from the original lower classes, are faced with much the same problems as confronted the highly educated mandarins of the *ancien régime:*

> Like mandarins expected to keep order in turbulent cities, the officials have found themselves constrained to make their weight felt by recruiting allies. Mandarins could

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keep order after a fashion if they brought the co-operation of powerful underworld bosses. The present regime has succeeded in promulgating far-reaching innovations that make an impact on the life of every individual in the country by enlisting the support of local power constellations. But the underworld bosses remain underworld bosses; and the parochial parties remain parochial parties. The history of political campaigning has been in larger measure a history of doomed efforts to change their nature...

In all societies nepotism is a fact of life, but essentially so in traditional China and modern Communist China:

An interesting trend noted at the beginning of the 1970s was the resurgence of 'clan-ism', which one might have expected to be long dead by this time. Officials in Hubein (Hupei) villages were said to be corrupted by 'feudal clan relations', and gave favours according to family connections. In a Guangxi (Kwangsi) brigade, control of the leading offices was seized by a single kin group.

Officials at the lower level of the Party hierarchy have relatively little power or privilege to dispense, but officials higher up the ladder have substantial leverage:

...Village officials, particularly at the level of the team (a small village or a group of households within a village) stand to gain little from their service, have few strings to pull, and must suffer the obloquy of those whose farm labour they supervise. But at the level of the brigade (a large village or a group of villages) things are different. The brigade leader has his feet on a ladder of real power. (Reporting a local power conflict, Parish and Whyte tell us that "If the attack on the brigade secretary failed, he could make their lives miserable.)

Remarkably, the author finds similarities between the Buddhist and the Marxist style of life. While Confucianism is outside the Marxist spectrum, Buddhist traditions often parallel those of Marxism, and consequently Chinese Communism has permitted many Buddhist traits to survive, and has even embraced some of these:

The institution of meetings for self-criticism is not new in China. Indeed, there is an interesting antecedent in the village covenant system or *xiang yue* (hsiang yueh) fathered by the Ming philosopher Want Yangming, where

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> evil-doers were urged in public village meetings to see the error of their ways and reform themselves by the pressure of community opinion voiced through discussion of their good and bad points. But there is a hoarier ancestry for the public confessional in the fortnightly *uposatha* ceremonies of the Buddhist community, at which each monk must scrutinize his conscience and identify all the transgressions of which he is guilty in public conclave.

Of course, public confessions are an excellent method of depriving the individual of his independence and self-dignity. They can also be used to target and destroy an individual who has lost influence in the hierarchy. The Maoist Gang of Four made particular use of public examinations to destroy their enemies. Not only did they use the ritual of self-examination and self-criticism, but they also utilized the educational examination system to advance those loyal to them and persecute those opposed to them.

> ...it was apparent that the politicians later dubbed the 'Gang of Four', Mao's wife Jiang Qin (Chiang Ch'ing) and her friends, were using their positions to influence education. One of their targets was the examination system, later reinstated despite the declared ideals of the cultural revolution, and the epitome of conservative institutions that rated 'expertness above redness'. Mao himself had said: "Our present method of conducting examinations is a method for dealing with the enemy, not a method for dealing with the people. It is a method of surprise attack, asking oblique or strange questions.

However, in recent years, and especially since the conclusion of the Cultural Revolution, there has been some easing of pressure upon the old "landlord class", who for decades had been deprived of participation in the Chinese scene. Now according to the author, the children of most of the "landlord" class (or at least of that portion of it that survived the post-revolution massacres) may obtain a university education – and since these children generally tend to be more intelligent than the children of the loyal Party members (who descend primarily from the erstwhile peasant class) the pressure to gain a place in the universities become more intense:

> One factor which might, in a small way, have served to intensify even further the competition for scarce college places was the inclusion in the ranks of those eligible the

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children of so-called 'landlords' and 'rich peasant', which we noticed before. In 1979 there were said to be about four million people in these categories; an examination conducted by the Central Committee of the Party determined that most of them had mended their ways and deserved to be counted officially as people; the label was removed from all but about 50,000 of them. A *People's Daily* article declared that there was now to be no discrimination against these families, previously denied any sort of political activity or even enrolment in senior secondary or tertiary education.

But the reality is that any political party will seek to protect its own members and to ensure its own survival. Thus, since access to education provides the key to power:

> China's leaders can be expected to choose educational policies, and deal with the opposition to them, in ways perceived to be most conducive to their political survival, not in ways which 'ought' to be adopted in an ideal world. Outside advice is gratuitous. In order to survive politically, they need to gratify as many as possible of the people in, or actively hoping to reach, positions of influence at all levels of society. By and large, such people have one or the other of two attitudes to education. For some, it is a ritual, difficult to undergo, which effectively sorts out the successful from the unsuccessful, to the benefit of the former. This is a traditional attitude, enshrined in the values of pre-Communist society. For others, it is a ritual of a different sort (ritual slogans, ritual memorization of cliches) which makes it possible for almost anybody to succeed if he has the 'right' ideas (whatever these may be). This attitude is one that may appear rational in a period of rapidly expanding opportunities; in the nature of the case not all periods are of this sort. It is an equally traditional attitude, but it is the tradition of folk culture and underworld organization rather than of 'Confucian' orthodoxy.

Even though the Gang of Four have been overthrown, the author believes that opportunity as enshrined in the educational system – in the right of admission to the higher levels of this system – will remain a prerogative of those at the apex of the Party hierarchy, thus perpetuating privilege as against freedom of opportunity:

> ...Many of the statements made in China nowadays

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sound enlightened to sympathetic outsiders, but the danger is clear enough that the victors in the contest with the notorious Gang should tend towards the rigid centralization, standardization and empty memorization characteristic of a difficult ritual that sorts out the mandarins rather than of good education.

INTERNATIONAL POLITICAL ECONOMICS
Bruno S. Frey
Basil Blackwell, New York.

Bruno Frey combines the tools of economic analysis with wide-ranging empirical data and practical illustrations to discuss issues like trade war, foreign investment and foreign aid. The discussion encompassses the origins of tariffs, the causes of international cooperation and the practical nuts and bolts of international organizations – in short, the intricate interplay of economic and political factors in international trade and relations. *International Political Economics* is a major contribution to its field. Its down-to-earth emphasis is marked contrast to the theoretical and abstract nature of its competitors and more traditional works. It is valuable reading for all who may be interested in international economics, international relations and political science.

NATIONAL HEALTH
John Vaizey
Basil Blackwell, New York.

Who pays when you are ill? The state? Your family? Since 1948 the British have expected the state to pick up the bill. But the system is looking increasingly expensive and ineffective.

John Vaizey argues that by going back to first principles we can see where the National Health Service has gone right and where it has gone wrong. Medical science is changing rapidly. So are concepts of 'health' and 'illness': what is more, people are no longer content *not* to be ill – they want to be 'fit'. But the NHS was set up to deal with tuberculosis and other infections which to all intents and purposes have been conquered. Today it deals with heart disease, cancer, arthritis, rheumatism and senility. How and how soon will these conditions be controlled – and at what cost?

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Considerations such as these have led John Vaizey to conclude that a far more flexible system of health care is needed in Britain. He presents a pattern for the evolution of health care that supersedes the barren discussion still perpetuated and prevailing between those who want the pure socialist milk of a National Health Service and those who want 'private medicine'. Both are unattainable goals and goods. A middle course, Vaizey argues, is not only practical, it is inevitable.

COMPETING EQUALITIES: Law and the Backward Classes in India
Marc Galanter
University of California Press, Berkeley.

Since 1948 India has been engaged in the most massive and far-reaching effort ever undertaken by a democratic nation to integrate an excluded population into the mainstream of national life. Eighty million Untouchables and thirty million tribal people are the beneficiaries of an elaborate system of "compensatory discrimination" that gives them special legislative representation as well as preferential treatment in employment, education, and goverment service. This is the first comprehensive study of the Indian experience.

Systematic preferential treatment has had major redistributive effects in India. Today, those once stigmatized as Untouchables play a role in public life that would have been unimaginable a few decades ago. These policies of compensatory preference are part of the disestablishment of the traditional caste hierarchy and thus of an unprecedented transformation of the structures at the core of Indian society. But the same egalitarian currents that fuel this upheaval have generated pressures to expand the coverage of preferential policies of reverse discrimination and to transform such discrimination from a temporary and exceptional device into an ongoing regime of communal quotas. Consequently these policies have provoked fierce resentment and have given rise to a variety of social ills, creating social tensions which were totally absent from the traditional pattern of Indian life, and which now challenge the security of Indian society.

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FOREIGN DEBT AND LATIN AMERICAN ECONOMIC DEVELOPMENT
edited by Antonio Jorge, Jorge Salazar-Carillo and Rene P. Higonnet
Pergamon Press, New York.

A comprehensive survey of the economic problems of Latin America with particular reference to the impact of the massive Latin American international debt on the world financial scene.

The problem of rescheduling this debt is discussed country by country in a survey which comprises a truly useful source book for the specialist.

THE DECADE OF ENERGY POLICY: Policy Analysis in Oil-Importing Countries
Paul Kemezis and Ernest J. Wilson III
Praeger Publishers, New York.

Oil prices were falling dramatically when this volume crossed the reviewer's desk, due partially to a weakening of the OPEC cartel by an increase in the number of oil producers but more particularly to a decline in oil consumption by the developed countries, as a result of over-pricing by the cartel and also of deliberate strategies resulting from governmental energy policies. The text is therefore timely and of interest to all who are concerned with energy and the future well-being of the world economy. Continued consumption of oil will inevitably reverse the present, temporary glut conditions, and energy conservation should remain uppermost in the minds of entrepreneurs and governments.

THE NEWSPAPERMAN'S PRESIDENT: Harry S. Truman
Herbert Lee Williams
Helson-Hall, Chicago.

Harry S. Truman's preferred platform for reaching the public was the newspaper. He was a voracious reader of news and student of journalism history and demonstrated a strong awareness of the influence of the press in American life.

Truman gave 324 press conferences while in office, covering topics as crucial to the post-war period as the atom bomb, the Korean war, and detente. Regardless of the subject matter,

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Truman's relationship with reporters, correspondents, copy-boys, and photographers was almost universally good. His early meetings with the press sparkled with humor and warm informality, establishing a rapport that led to many notable exchanges.

In the early chapters of the book, the author describes Truman's affinity for the news, his knowledge of press history, his opinions on the influence of the press on the public, his honesty in answering questions from the press, and his view of the press.

Truman's criticism of the press was largely based on political, not philosophical, grounds and focused amost exclusively on the upper echelons of newspaper organizations: the editors, columnists, and newspaper owners who Truman variously labeled the "opposition," "one party," or the "lying" press. Later sections of the book deal largely with Truman's dissatisfactions and notable run-ins with the press, including the issue of censorship, the campaign against Dewey, the influence of special interest groups in the media, and Truman's view of the impact of editorials on public opinion.

POWER AND JUSTICE: The State in Industrial Relations
E.A. Ramaswamy
Oxford University Press, New York.

Indian industrial relations are essentially triadic, with the state seated firmly in the saddle as conciliator, arbitrator and adjudicator. The way the state exercises its power has profound significance for labor, management and society. Whom does the state favor when it mediates in the industrial relationship and decides what labor and management will give to, and get from, each other? The Marxist answer is that capital is favored. The pluralists see the state as a neutral referee ensuring the fair interests of both disputants and the greatest good of society.

And what are the conclusions of the author? He finds that the cost of Indian bureaucratic/political intervention in the area of commerce and labor relations is high. In his own words:

> Both labour and capital pay a price when the wielders of state power seek to realize their partisan goals. They have to pay a higher price than they would to each other in a bilateral negotiation. In a situation where they have both

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surrendered the initiative to the state, they cannot escape this fate . . .

INFLATION & UNEMPLOYMENT: Theory, Experience and Policy Making
edited by Victor Argy and John Nevile
George Allen & Unwin, Boston, Sydney.

The upsurge in both inflation and unemployment during the 1970s, the breakdown of the Bretton Woods system and the switch to flexible exchange rates, the two oil price shocks in 1974 and 1979, all created acute policy dilemmas for policy-makers in industrial countries and posed new challenges to economic theory. Now, some years after these events, there is a need to look closely at the implications of some of these developments for theory and even more importantly to review how various countries in the OECD deal with these problems and whether or not there are lessons to be learned from their experience. With this aim in mind the editors have brought together an eminent group of economists from all over the world, representing academia, official institutions and international organisations.

This volume collects together major essays dealing with theoretical issues and country experiences together with an Introduction from the Editors. Part I is on Theory and General issues and has contributions from Willem Buiter and Marcus Miller, Stanley Fischer and Victor Argy, among others. Part II reviews the experience of developed countries, including Japan, Germany, the UK and USA, with articles also on the OECD as a whole, and small, open economies, Part III covers the particular case of Australia and analyses a wide range of macro and micro economic problems.

BILINGUALISM: Social Issues and Policy Implications
edited by Andrew W. Miracle, Jr.
The University of Georgia Press, Athens.

Ethnic identity is very dear to any self-conscious people, and is intimately associated with language. Thus minority groups are anxious that their language should be preserved. At the same time, nation states which acquire large minority ethnic groups are ambivalent about these, with the political

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leaders desiring to see the minority absorbed into the majority to avoid socio-political tensions, whether or not the majority minority desire that outcome. In these days of state-standardized education, bilingual education will inevitably become an important political issue in all multi-ethnic states. This text comprises a number of essays which explore the topic in a broad, but not over-deep fashion. It will be of interest to those involved in bilingual educational issues, but cannot be regarded as comprehensive.

WINNERS AND LOSERS IN COLOMBIA'S ECONOMIC GROWTH OF THE 1970s
Miguel Urrutia
Published for the World Bank, Oxford University Press, New York, Oxford.

Author Miguel Urrutia takes issue with the suggestion that Colombia's failure to launch any grand social experiments indicates a country in which only the rich get richer, while the poor get poorer. It is true that Colombia suffers from the population explosion which makes so many Third World countries almost ungovernable, but his in-depth survey of the distribution of wealth in Colombia during the 1970s arrives at the conclusion that until the recession of the 1980s, Colombia's poor had been progressively improving their economic status.

QUEBEC AND CANADA
Past, Present & Future
John Fitzmaurice
St. Martin's Press, New York.

Whenever Canada is in the news – the battles over conscription in both world wars, General de Gaulle's famous *'Vive le Québec libre!'*, the wave of FLQ terrorism, the referendum of 1982, the Repatriation of the Constitution in 1982 – it is often because of Québec. Québec – geographically splitting the English-speaking provinces, historically the very origin of Canada, economically central and with a quarter of Canada's population – is the key to an understanding of Canada.

Most analysis which has appeared in English tends to regard the pan-Canadian perspective as the norm against which the deviant, reactionary or obstructionist attitudes of Québec itself

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are compared, thus producing the sterotyped image of *'La Belle Province'* as introverted, unstable and ultra-nationalist.

This book undertakes a voyage through Quebec history, society and politics, seeking to discover the causes of the survival and vitality of the Québec community. It looks at the major social and economic change in Quebec during the 1960s, called collectively the *'Révolution Tranquille'* (the Quiet Revolution); the political system; and the rise of a determined nationalist movement, which achieved political success by gaining power in 1976, but has so far been unable to secure majority support for its concept of Sovereignty coupled with an Association (basically to maintain free tradé) with the rest of Canada, and could not prevent Trudeau from securing his long-desired aim of 'repatriating' the Canadian Constitution. What lessons the *indépendantiste* movement and Quebec society as a whole will draw from these recent events belongs to the future, but the analysis offered here may provide some pointers.

SOCIAL WELFARE OR SOCIAL CONTROL?
Some Historical Reflections on *Regulating the Poor*
Edited by Walter I. Trattner
The University of Tennessee Press, Knoxville.

In recent years the literature on social welfare has become dominated by the thesis that political and economic elites use the nation's public and private welfare institutions and organizations not to help the needy but to direct and control their behavior. According to this argument, relief is given to the poor not out of concern for their plight but, instead, to prevent the disruption of society and preserve the capitalist system.

This highly cynical view is examined and contested by the author, who sees the welfare society as being a pivotal development in history, revealing the new powers of the masses, organized by political groups for their own benefit, in an assault on capitalism. As the author declares:

> Still, the success of this assault may not be entirely foreordained. Perhaps at this juncture in the evolution of capitalism and democracy, capital will not prevail. Although we do not underestimate the scale and force of the contemporary mobilization against entitlements, it is true that the political economy of the late twentieth century is not that of the nineteenth. The relationship of

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state to economy has been drastically altered in ways that provide powerful support for the idea that people have a right to subsistence, and particular legislative or executive actions may not be sufficient to extinguish that idea. Among other things, public relief, once the sole form of state intervention to ameliorate destitution, has come to be embedded in a general structure of income support programs for a wide range of constituencies, whether the aged, the disabled, or the unemployed. The profound changes in American society that gave rise to this broad development suggest the possibility that the cyclical giving of subsistence resources by the state has come to be replaced by a system of enduring economic entitlements. Consequently, we think it probable that a wide range of groups will resist the Reagan administration's efforts to dismantle the social welfare state, and that they are likely to prevail . . .

If this prediction is confirmed by events, it will be for the reason that the poor and unemployed, and other working-class groups as well, mobilize in disruptive political resistance, and for the reason that government will be vulnerable to that resistance. This is a critical moment; a great deal is at stake. The emergence of the welfare state was a momentous development in American history... if the present-day mobilization against the welfare state fails, that too will be momentous...

The author does not enquire how long the welfare state would be able to co-exist with successful democracy, or whether it will usher the nation along the seemingly irreversible path to totalitarian rule. But his examination of the forces at work in America at this crucial moment in history is both stimulating and salutory.

FEDERALISM IN NIGERIA
S. Egite Oyovbaire
St. Martin's Press, New York.

This is an important publication, which may help to alert attention to the undesirability of multi-ethnic or "plural" states as places in which people may fulfil themselves and live in harmony with their neighbors.

In common with all colonial Africa, Nigeria found itself,

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as a result of the sudden craze for immediate decolonialization following World War II, given independence as a "nation" state, when in point of fact it had few features to qualify it for status as a nation. The only thing that its ethnic components had in common was a brief tradition of British rule, resulting in a legacy of legal and political institutions based on the British tradition – a tradition which was in any case alien to each one of its own diverse cultures.

If the Europeans had acted wisely during the period of decolonization, they would have taken the time to redraw the boundaries of Africa to allow independence to traditional groupings of peoples who spoke a common language and shared a common heritage, and who would consequently have had a better chance of living together harmoniously in autonomous states. Instead, the European governments seem to have held the view that to grant independence to nation states delineated along meaningful cultural, linguistic and historical boundaries might be a 'racist' act, and so they took the easy route and handed over power to new states whose boundaries followed the accidental colonial boundaries, and invariably cut across the tribal and ethnic lines. As a result of this fact, more than anything else, independent Nigeria (despite the oil wealth it acquired when it seized British oil companies) has had a terribly troubled history. To live together, people need more than a single government and a single political boundary – they need a common cultural tradition. The author, himself a Nigerian, reveals this fact with awful accuracy as he details the tragic history of post-independence Nigeria.

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